LOOSE-LEAF MODERN MEDICAL TREATMENT

by

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INTRODUCTION

This book was planned many years back when I was still a beginner in my profession and looked into numerous medical catalogues for a volume on treatment that would answer to my professional needs,—a volume that would contain the essentials of technique, physical therapy, recent progress and systematic treatment of diseases and could yet be kept up-to-date from year to year The search was futile No single volume could be found to answer to my requirements Separate and expensive books had to be purchased every year on new techniques, physical therapy, recent progress in treatment and allied subjects. Many a time pecuniary considerations came in the way and recent progress had to be dispensed with Essentially I am, and have always been, a medical man But the events that followed August, 1942, drew me into a situation that gave me the leisure that I otherwise could not afford, to mature my plans on the writing of a book I thought would prove useful to many practitioners whose needs to-day are no different from what my own needs were, more than twenty years ago For, though years have rolled by, the position to-day with regard to a comprehensive volume on treatment, still remains what it used to be when I first began my medical career

Throughout the book an emphasis has been laid on rest, diet, a rational and hygienic mode of life and physiotherapeutics In fact it would seem that physiotherapeutics and some other subjects have received a disproportionately large amount of attention This is deliberate and has been done with the intent of dethroning the bottle of medicine from the high place it has occupied so long in the treatment of disease. The unfortunate tendency in most medical men to depend too much on the bottle of medicine has induced a corresponding belief in the average patient that the bottle of medicine is his only salvation The result has been not only a most criminal neglect of effective and useful therapeutic agents like Light, Heat, Sun, Water, Massage, and Rest and Exercise on the part of the physician but has also passed these agents for exploitation of lay public into the hands of a most unscrupulous tribe of pseudo-scientific nature-healers For those, therefore, of my readers who hope to be benefited by a perusal of this book, may I utter a word of advice "Use drugs intelligently and sparingly. Do not over-medicate Over-medication can be more harmful than no medication. Do not order a drug where none is needed Do not make an injection which you can do without Encourage a hygienic and rational mode of living in your patients. Help them to make full use of agents that cost very little and yet are of immense value,—fresh air, water, light, heat, rest and exercise. Tell them more about balanced and suitable diets. Above all be honest and conscientious in all you do"

The book is divided into two parts The first part deals with general principles. In second part will be found the systematic treatment of diseases. At the end of the book there are nine appendices which give relevant information on a number of subjects that the physician is likely to require from time to

time. The reader's attention is drawn especially to the last appendix which deals with hot springs and mineral waters of India.

My thanks are due to those numerous writers on medical treatment whose works I have freely consulted Only a few of these could be mentioned in the bibliography. For the appendix on mineral springs I am indebted to Dr. Chhiber's book on The Physical Geography of India I am also indebted to S Balwant Singh, B A, LL B, General Manager, Mercantile Bank of Hyderabad for the valuable help he gave me in the preparation of the manuscript Without the unfailing help of Mr A P. Bhargava of The Calcutta Phototype Company, Ltd, this book could not have been possible. To him I owe more than I can express in words Finally, I shall feel grateful to those of my readers who care to make suggestions for the improvement of the book. It will be my endeavour, as far as possible, to incorporate these in the replacement pages which it is intended to supply each year at a small cost, to keep the book always up-to-date.

LUCKNOW. M. L GUJRAL

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PART I

CHAPTER I

THERAPEUTIC PROCEDURES

GASTRIC ASPIRATION

A thin Ryle's tube or a Hamilton-Bailey tube and a syringe are required. The end of the tube is lubricated and passed down the nose and the nasopharynx When this occurs, the patient is given sips of water to swallow. Each time he swallows, the tube travels down the esophagus. When it is well within the stomach, the tube is fixed to the cheek by adhesive plaster A suitable syringe is now attached and aspiration carried out. As the patient can drink freely by mouth and the gastric contents can be aspirated soon after, this is an effective way of washing out the stomach

GASTRIC LAVAGE

If stomach is to be washed in poisoning it is better to employ an ordinary stomach tube (gauge 18 to 24) attached to a funnel by the usual glass and rubber connection. The tube should be marked at a distance of 18 inches from the tip by putting a small strip of adhesive plaster round it The patient should be sitting up and sitting forward with the chin well up on the chest. He should breathe regularly and quietly all the time the tube is being passed to avoid retching The wet, sterilized tube is passed slowly but deliberately until the 18 inch mark is at the teeth. The fluid used for lavage (warm water or a 5 per cent solution of sodium bicarbonate) is allowed to flow slowly into the stomach. Not more than one to one-and-a-half pints should be introduced at one time. When the required amount has entered, the funnel just before it is empty is lowered and inverted over a basin and the stomach emptied by siphonage. The process is repeated till the returning fluid is clear.

GASTRIC GAVAGE

A No 18 or 24 stomach tube passed in the manner described, instead of being used for lavage, may also be utilized for patients who cannot or will not eat or take medication.

NASAL FEEDING

A soft rubber catheter to which is connected a funnel and a rubber tube by means of a glass connection is required. For children a No. 4 to 6 catheter is suitable, for adults a No 7 to 10 The catheter is lubricated and passed along the floor of the nose. The patient is then turned on his side. Before starting feeding, the physician should make sure that the catheter is in the esophagus. As a final precaution water should always be poured down the tube first for safety.

INTESTINAL ASPIRATION

Intestinal aspiration is carried out by the Miller-Abbot tube. It is a procedure of great value in the treatment of intestinal obstruction; in paralytic ileus it may be life saving. The Miller-Abbot tube is a double channel rubber tube of great length; the bigger channel is for aspiration, the smaller one for inflating the rubber balloon The nose and the throat are cocainized with a 2 per cent solution and the lubricated tube passed bag-end forward through the nose and the nasopharynx. The patient now swallows sips of water till the bag reaches the stomach. Approximately 30 c.c. air is now introduced into the balloon and gentle traction applied until the balloon is felt to come up against the cardiac orifice. It is then deflated and the patient allowed to lie comfortably somewhat on the right side. With patient taking frequent sips of water and the bag deflated the stomach contents are aspirated. While this is going on, the tube is slowly but steadily advanced until it is judged that the pylorus has been reached (this occurs between 45 cm. and 75 cm. marks). A common mistake with the novice is that he is likely to push in too much of the tube so that it coils up in the stomach and the end comes to point towards the cardia.

Every half hour the balloon is inflated and very gentle traction exercised on the tube in the hope of obtaining a tugging sensation which signifies that the bag has passed the pylorus Aspiration of undiluted bile or intestinal contents is also a proof that the tube has passed the pylorus.

If a portable X-ray apparatus is available, the bag is guided as far as pylorus under direct vision. It will then be carried through the pylorus in a few hours provided too much of the tube is not introduced into the stomach to permit its coiling up in the wrong direction.

The Miller-Abbot tube should not be hastily withdrawn. When all apprehension of a relapse is over the balloon is deflated and the tube withdrawn very slowly taking from 10 to 15 minutes over the process

ENEMATA

Enemata may be given by a Higginson syringe which requires the use of a certain amount of force or by the use of the douche-can in which fluid runs into the rectum by gravity The latter method is to be preferred. The following are the chief varieties of enemas:

1. *Cleansing Enema*—The reservoir is kept approximately 2 feet above the bed. The patient is kept in the left lateral position or on his back. The solutions commonly employed are soap and water, tap water or isotonic saline. From 2 to 3 pints of the fluid are allowed to slowly run in. The patient is then given a bed pan and instructed to retain the fluid for as long as he can. From 10 to 15 minutes are usually required for a good cleansing effect.

2. *Glycerin Enema*—This is used when introduction of large amount of fluid into the rectum is not desired. One part of glycerin is mixed with two parts of water or equal parts of glycerin and water are mixed and run in from a reservoir by gravitation. The total quantity should not exceed 4½ ounces.

3. *Olive Oil Enema*—This is used in fecal impaction and as a retention enema in ulcerative colitis. Olive oil 4 to 8 ounces is slowly run into the rectum, the buttocks being raised on a pillow.

4. *Turpentine Enema*—This is given when tympanitis is present. Half to one ounce of turpentine is mixed and beaten up to form an emulsion with an equal quantity of olive oil or the white of an egg and a pint of soap and water added. The amount is slowly given from an enema-can.

5. *Starch and Opium Enema*—Starch 120 grains is stirred into 5 ounces of cold water, brought to boil and cooled. To this are added 30 minims of tincture opii. The enema is slowly run in by means of a glass funnel and rubber catheter. It is of value in checking diarrhea and tenesmus in ulcerative colitis and bacillary dysentery.

6. *Anthelmintic Enema*—It is used to clear the bowel of thread-worms. The solutions used are a hypertonic saline (2 tablespoons of salt to a pint of water) or an infusion of quassia chips.

7. *Magnesium Sulphate Enema*—One to two ounces of magnesium sulphate are dissolved in 4 to 8 ounces of water (the mixture should be a 25 per cent solution) and slowly run into the rectum It is often employed in cases of head injuries to reduce intra-cranial tension

8 *Chiniofon, Quinoxyl, Yatren Enemata*—This is used as a retention enema for eradicating infection due to Entameba Histolytic. From 4 to 6 ounces of a 2½ per cent solution in water are run in slowly from a funnel and rubber catheter The treatment is given daily for 10 days in conjunction with oral treatment for amebiasis

9. *Sulfa-guanidine and Sulfa-diazine Enemata*—Two grams of sulfa-diazine or 6 grams of sulfa-guanidine are suspended in six ounces of water and run in slowly from a catheter and funnel. The treatment is given at first daily, then on alternate days and later still more infrequently in ulcerative colitis.

10. *Paraldehyde or Avertin Enemata*—These are of use as basal narcotics and in diseases like tetanus and eclampsia to suppress convulsions The dose of paraldehyde is 1 dram to a stone of the body weight The calculated amount is added to 4 ounces of water and the enema slowly run in from a funnel attached to a rubber catheter by rubber tubing Not less than 5 minutes should be taken to complete the injection. A dose of atropine is then given hypodermically.

Avertin is given in the same manner. The dose is 0 1 G per kilo body weight and the calculated quantity is given as a 2½ per cent solution in distilled water. This drug must be shaken vigorously into water while preparing the enema and the temperature must not rise above 104° F.

RECTAL INFUSION

Rectal infusion is simple to administer and neither special apparatus nor asepsis is required. A solution containing 60 grains of sodium chloride to a

pint of water is allowed to gravitate into the rectum through a funnel and tube connected to a catheter. The buttocks are kept elevated and the funnel is held at a height of 1 foot above the patient. The rate of flow is about 80 drops to a minute or 300 c.c. per hour. Its disadvantage is that the fluid is frequently returned.

INTRADERMAL INJECTIONS

Intradermal injections are used in performing certain tests such as Schick, Dick or Mantoux, in testing for skin sensitivity prior to injections of sera and in desensitization in allergic conditions. A very short fine needle with a small bevel is selected. A small non-hairy area on the flexor aspect of the forearm is sterilized and stretched between the index and the thumb. The needle is inserted into the skin at a very acute angle (almost parallel to the surface) with the bevel facing the operator. If the injection is made correctly, resistance is felt on injection and a white wheal is raised above the skin level Intradermal injections are usually not more than 0.1 c.c.

SUBCUTANEOUS INJECTIONS

This is the most frequent route for parenteral therapy. The amount of injection is usually small ($\frac{1}{2}$ to 1 c.c). The needle used is short and fine (24 to 26 gauge). The skin is cleaned with spirit, drawn taut or picked up firmly between the fingers and the needle quickly inserted. The piston is withdrawn slightly to see that a vein has not been entered and if no blood is drawn the contents are injected and the needle withdrawn.

SUBCUTANEOUS INFUSIONS

When large amounts of fluid are required to be given subcutaneously, the fluid is introduced by gravity from a flask. The needle used should be long and large (18 gauge) and inserted deeply into the pectoral region or the lateral aspect of the thigh. The rate of flow should not exceed 1 liter an hour. The solutions used are normal saline or 5 per cent dextrose in normal saline.

INTRAMUSCULAR INJECTIONS

A 22-gauge needle about 2 inches long is used. The route is useful for small volumes of irritating or suspended substances. The sites recommended are the upper and outer quadrant of the gluteal region, the deltoid if the volume is small, the lateral aspect of the thigh and the pectoralis major. As with other injections the skin is cleansed with spirit and the needle with the charged syringe attached, is plunged perpendicularly into the muscle. The piston is withdrawn slightly to see that the needle is not in the vein and the contents injected if no blood is withdrawn. If the needle touches the bone, it should be slightly withdrawn before making the injection.

CONTINUOUS INTRAMUSCULAR INFUSIONS

The apparatus required is a flask, rubber tubing, an interceptor to regulate the flow and a large bore needle. Bili-Moria and Dunlop's needle for intramuscular administration of fluid has an adjustable shield and makes

the procedure easy. The best site for injection is the lateral aspect of the middle third of the thigh. The needle is inserted deeply into the muscles and the adjustable shield fixed making further penetration impossible. Once the needle is in place it can be kept in position by adhesive tape placed over the shield. A rate of about 40 drops per minute is suitable.

INTRAVENOUS INJECTIONS

Intravenous injections play a large part in modern medical and surgical practice. The needle used is a large, hypodermic one with a short bevel. It must be sharp, as blunt needles tear the vein. It is an advantage to have a syringe with an eccentric nozzle. A rubber tube and an artery forceps form an ideal tourniquet.

A vein in front of the elbow is usually selected and the skin over it thoroughly cleaned with spirit. The elbow is kept fully extended if necessary by keeping a folded towel underneath it. The tourniquet is applied to make the vein more prominent The vein is immobilized by the fingers of the left hand, and the needle inserted. If the needle is in the vein a gentle traction on the piston will draw blood into the barrel On no account is an injection to be made if the blood fails to appear in the barrel of the syringe or a swelling appears at the site of the injection. After the injection has been made a spirit swab is pressed at the site and the needle withdrawn The patient is asked to flex the elbow over the swabs for a couple of minutes. No further dressing is necessary.

Intravenous injections must be made extremely slowly.

For intravenous therapy in infants, external jugular vein is suitable. A seated assistant holds the child facing away from him, with its head lower than its body. The needle pointing toward the chest, is introduced where the vein crosses the sternomastoid.

CONTINUOUS INTRAVENOUS INFUSION

Continuous intravenous infusions are often life saving, yet if given without a proper appreciation of the patient's condition they may prove death's agents When a patient is being given fluids intravenously a balance sheet of input and output of fluids must be maintained Intravenous infusions are contra-indicated in heart failure, pulmonary congestion, hypertension and Bright's disease. The solutions used are normal saline or 5 per cent dextrose in a normal saline. Sterile ampoules for making the solutions are obtainable. If solutions have to be made, the sodium chloride used should be sterile and pure and only triply distilled water, not more than a week old, employed

The apparatus required consists of a suitable reservoir, rubber tubing, a drip interceptor and an intravenous cannula. The whole apparatus must be working properly and the filled reservoir suspended suitably before the patient is prepared for the injection The vein selected is usually one in front of the elbow. If a suitable vein cannot be felt or seen in this region, one anterior to the internal malleolus is selected In exceptional circumstances

the external jugular vein as it crosses the sternomastoid may be made use of. The skin and the operator's hands are carefully sterilized. A tourniquet (rubber tube and artery forceps) is applied. If the patient is conscious a local anesthetic is injected into the sterilized skin over the vein and a small transverse incision made over the vein. The beak of a small artery forceps is introduced into the wound and its jaws opened widely. This manoeuvre is repeated until the vein has been cleared from the subcutaneous tissues. The entire circumference of the vein is cleared over a distance of 1 cm. and a double ligature passed underneath it. The distal one is tied. The vein wall is picked up with a dissecting forceps and with fine pointed scissors a triangular flap is raised. The cannula is introduced and the proximal ligature encircling the vein tied in a half knot With the cannula in position, the wound is closed about it and the cannula fixed to the skin by means of stitches passed through the slots. The limb if arm is kept at rest on a carr's splint, if leg, on a posterior splint with foot-piece. The rate of flow should be about 50 drops per minute or 6 pints in twentyfour hours. In urgent cases the rate of flow may be accelerated to 100 drops at the commencement. When the amount of fluid required is not large or the physician is in doubt as to how much to give, not more than 30 drops to a minute should be given. The best way of keeping the fluid warm is to place hot water bags round the receiving limb. Ready for use infusion sets "vacoliter" and "venuflask" are on the market.

SINGLE DOSE INTRAVENOUS INFUSION

Single dose intravenous infusions are of immense value in private work. The needle used must be sharp and of a large bore. A Kaufman's syringe which allows the needle to be correctly inserted in the vein before the infusion is started, is of great advantage. The system is carefully cleared of air bubbles and the infusion commenced, care being taken that the fluid is kept warm by hot water bottles, placed around the receiving limb. Five hundred c.c. (1 pint) may be given in 15 to 30 minutes When the veins are collapsed, the open method should be employed

MARROW INFUSIONS

Marrow infusions are useful in collapsed patients in whom it is difficult to cannalize the vein. In adults the site is the sternum ; in children the subcutaneous surface of the tibia is used as the sternum contains no marrow.

The skin and the subjacent tissues right down to the bone in the middle line just above the manubriogladiolar junction are anesthetized with a 1 per cent solution of novocain. The special winged trocar and cannula for sternal puncture is inserted just above this ridge, the point being directed almost directly towards the floor, but with a very slight inclination towards the patient's head. The pressure is gradually increased till the outer plate is penetrated (the feeling of the outer plate having been penetrated is unmistakable). The trocar is removed and a 10 c.c. record syringe charged with sodium citrate solution is attached to the cannula and some of the solution injected. The piston is withdrawn if marrow is liberally withdrawn (it looks like blood) the end of the cannula is within the marrow cavity. The cannula

is quickly linked with infusion unit previously freed from air bubbles. Strips of adhesive tape fix the wings of the cannula to the chest wall.

2. In infants a special marrow trocar and cannula for puncturing the subcutaneous surface of the tibia, is employed. It is manufactured by Allen and Hanbury Ltd.

VENESECTION

Venesection is performed for blood transfusion and as a therapeutic measure in cardiac asthma and acute pulmonary edema, congestive heart failure, hypertension, polycythemia and uremia. A tourniquet is placed on the arm. The skin over a cubital vein is cleansed with iodine and alcohol and a large bore needle (gauge 12) inserted into the vein. The needle and the tube should be in the direction of the hand, previously flushed with citrate to prevent clothing. From the needle a short length of rubber tube leads to a flask. When a free flow is not obtained the rubber tubing from the needle may be joined on to a suction flask (Dr. French's apparatus). From 10 to 20 ounces of blood may be withdrawn. Venesection is contra-indicated in low arterial tension and anemia.

BLOOD TRANSFUSION

Indications: The following indications are usually given—

1. Anemias.
   - (a) Post hemorrhagic anemia when the Hb percentage falls below 30 per cent
   - (b) Aplastic anemia.
   - (c) Pernicious anemia
   - (d) Acholuric jaundice
   - (e) Acute hemolytic anemias
   - (f) Severe anemias of infancy.
2. Hemorrhagic states
   - (a) Hemophilia.
   - (b) Purpura
3. Acute infections.
   - (a) When patient suffering from an acute infection has severe anemia.
   - (b) In septicemia and pyemia.
   - (c) In fulminating cases of acute fevers against which the serum of a healthy adult donor is known to contain powerful antibodies
   - (d) Chronic sepsis where patient has become markedly anemic.
   - (e) When the patient is resisting poorly a local infection.

4 Before a major surgical operation is performed upon a patient with , anemia.

5. Coal gas and similar poisonings.

Grouping. Formerly the blood was grouped according to Moss's classification into groups I, II, III and IV. At present they are classified on the presence or absence of the two possible agglutinogens A and B within the red blood corpuscles—

Group I Moss=AB (International)

Group II Moss=A (International)

Group III Moss=B (International)

and Group IV Moss=0 (International).

The Indirect Method—Tubes of stock serum of groups A and B (Moss II and III) are procured. The serum must not be more than 3 months old. A white tile or a welled slide with three depressions is taken and on this is written A and B Under A is placed one drop of stock serum A and under B one drop of stock serum B The recipient's ear is sterilized with ether, pricked and a drop of blood squeezed A very small amount of blood is taken on a glass rod or bacteriologist's platinum loop and transferred and mixed intimately with stock serum A. A similar amount is transferred on a second glass rod or platinum loop to stock serum B Most mistakes in reading the results are due to using too much blood. The tile or welled slide is then gently rocked so as to impart a little movement to the drops. Agglutination can be seen in good light with the naked eye If it occurs within a minute or two of mixing, the redness within the drop becomes patchy and may be likened to a brick dust; if there is no agglutination at the end of 15 minutes, it can be assumed that the test is negative The reaction in the two drops is noted and the result interpreted as follows · agglutination in both sera A and B, recipient's group AB; agglutination in stock serum B, recipient's group A; agglutination in stock serum A, recipient's group B, no agglutination in any sera, recipient's group 0.

The Direct Method—The direct method is very useful, it is the only method when stock sera are not available. A few c c of blood are removed from the recipient's vein, transferred to a test tube and allowed to clot firmly. A little of the residual clear serum is then removed with a pipette and a drop of this placed on a white tile. The perspective donor's ear is sterilized and pricked and with a glass rod a small portion of blood transferred to the centre of the drop on the tile. After mixing and rocking gently for at least 5 minutes, the drop is examined in good light with the naked eye. If no agglutination occurs in 10 to 15 minutes the perspective donor's blood is compatible with that of the recipient. For obtaining good results "much serum and few cells" should be the rule.

Reactions: The reactions that may follow blood transfusions may be grouped under the following headings:

1. *Minor Reactions*—These are headache, nausea and a shiver (as opposed to a real rigor) When the reaction is very slight, the rate of flow should be reduced to 20 to 30 drops a minute and if you are not perfectly satisfied the transfusion should be stopped forthwith.

2 *Anaphylactic Reactions*—These are more likely when the same donor is employed for a second transfusion Fever, nausea, dyspnea, urticarial rash and circulatory collapse are the common symptoms. The transfusion should be stopped at once and ½ gr of ephedrine or ½ c.c. of 1 in 1,000 adrenaline injected.

3. *Hemolytic Reactions*—The first symptoms often appear while the transfusion is in its early stages. The patient complains of pain in the lumbar region and in the chest. This may be rapidly followed by a rigor, circulatory failure and difficulty in breathing. Later, jaundice, hemoglobinuria and oliguria are in evidence If patient survives these early phenomena of hemolytic shock, an due to precipitation of hemoglobin in the renal tubules is likely follow. If the transfusion is at once stopped and the urine render alkaline by intravenous injections of 2 per cent sodium bicarbona at the earliest possible moment, a fatal issue can often be avoided Sodium citrate and sodium bicarbonate gr 30 each should be given by mouth three or four times a day for a week

4. *The Rhesus Factor*—RH factor is present in 85 per cent of the human beings and 100 per cent of rhesus monkeys The 15 per cent human beings who are rhesus negative are prone to develop antibodies as a result of transfusion with rhesus positive blood So also are pregnant women who are rhesus negative but have a rhesus positive fetus These Rhesus antibodies are capable of giving rise to hemolytic reactions

Technique—A suitable donor of the group to which the patient belongs or failing that a universal donor (Group IV Moss or 0 International) is selected It is necessary to cross-match the donor's and the recipient's blood before transfusing About one pint of blood is collected (preferably when the donor is fasting) into a sterile flask containing 60 c c of 3 8 per cent sodium citrate solution. The technique for withdrawing the blood is the same as described under venesection. A tourniquet (a sphygmo-manometer cuff inflated about 40 mm. Hg.), is applied high above the elbow The skin of the antecubital region is prepared with ether and decked with sterile towels. A small amount of citrate solution is run through the tubing and the attached needle and the needle inserted into the vein, preferably with the point towards the donor's hand. The blood flows through the tubing into the flask which is kept in a bowl of water with a temperature of 100° F. The bowl is held by a nurse who constantly but gently rotates the flask therein. The citrated blood is gently stirred with a glass rod by an assistant. To remove froth, the solution is strained through six layers of sterile gauze before being transferred to the recipien

The blood is then run into the vein of the recipient by gravity in precisely the same way as a massive saline infusion. The apparatus is filled with saline solution and once the saline is seen to be flowing satisfactorily, blood is poured from the receptacle into the reservoir through gauze. Finally before the cannula is removed, a few ounces of saline are allowed to run into the vein The blood must be transfused slowly, at least 15 minutes being taken to give 500 c.c. The first few ounces should be given at the rate of 25 to 30 drops a minute.

Transfusion with a Sterivac—It is a simple and efficient method and has the advantage that the blood collection is closed. The apparatus consists of three parts the sterivac which is a doubly sealed bottle, containing the required amount of citrate solution in a vacuum; the donor set which combines together with needle and tubing, a special valve; and the recipient set, which consists of a needle and tubing, a metal lever for lifting out the metal knobs from the holes in the stopper and a stainless steel filter drip

A suitable donor having been selected, the sterivac and the donor set are connected by piercing the rubber cork of the sterivac in the position indicated, with the pointed end of the special valve. The forearm of the donor is prepared in the usual way and the needle of the donor set inserted into the vein. The valve is slowly opened by turning the knob in an anti-clockwise direction. The blood flows into the bottle and rate of flow can be regulated by turning the knob in the appropriate direction. All the time that the blood is being collected the sterivac should be gently rotated to mix the blood with the citrate. When the necessary amount has been collected, the knob is turned in the opposite direction and the needle removed from the donor's vein.

In administering the blood the recipient set is connected to the sterivac by inserting the dripper into the bigger hole in the stopper. The smaller hole carries a glass tube which allows the air to pass into the bottle, thus permitting gravitation of collected blood into the recipient's vein.

Stored Blood—During recent years blood banks have been established everywhere and more and more of stored blood is being used where only fresh blood could be used. Stored, preserved blood settles into its constituent layers. The supernatant plasma should be lemon-yellow in color and tolerably clear. Cloudiness in the plasma is due to presence of lipoids, and donors should be requested not to consume a fatty meal within four hours of giving blood. Hemolysis may be due to several factors; infection; age, *i e.*, over 21 days of storage; freezing (stored blood should be kept at 38° C), and warmth (if blood is removed from the refrigerator, it should be used within 8 hours). Hemolysed bloods must be discarded.

Plasma or Serum Transfusion—Indications for its use are in shock and burns, conditions in which fluid is required but no hemoglobin. It is also effective in hemorrhage if the hemoglobin percentage is not below fifty. Its advantage is that no matching [illegible] d. Plasma or serum is supplied in two forms: (*a*) liquid, (*b*) dried [illegible] will keep for months at a temperature of 4° C. Dried plasm[illegible] in [illegible] room temperature

It is marketed by Sharpe and Dhome under the name of Lyovac. Lyovac is sold in sets ready for use. Dried plasma can be reconstituted by dissolving *30 G.* of powder *in 400* c.c. of pyrogen free distilled water. Plasma is administered in the same manner as blood.

PARACENTESIS ABDOMINIS

Abdomen becomes distended with fluid as a part of generalized edema in tuberculous ascites or portal cirrhosis. Removal of fluid in such cases often brings great relief, and should be resorted to, when distension embarrasses movement, respiration or the heart's action.

A Southey's or other fine trocar and cannula is connected to a rubber tube which drains into a large bucket at the side of the bed. The best site for puncture is in the middle line half way between the umbilicus and the symphysis pubis, care being taken to first empty the bladder A broad binder is placed round the upper part of the abdomen The patient is made to assume a semi-reclining position to enable the fluid to gravitate downwards The skin is surgically cleaned. An intradermal wheal of local anesthetic is raised at the point of puncture and subjacent tissues infiltrated A small cut is made through the skin of a size enough to admit the point of a trocar, and stretched to accommodate the cannula. The trocar and cannula are then pushed slowly through the abdominal wall. When the cavity is entered, the trocar is withdrawn and the fluid allowed to drain out into the bucket As the size of the abdomen becomes smaller the binder round the upper abdomen is tightened, but if the patient feels faint the flow is temporarily stopped until he recovers When the fluid has been drained the cannula is removed and the point of puncture sealed with collodion.

THORACENTESIS

The patient should be either in sitting position or propped up. The site of election is in the eighth intercostal space in the posterior axillary line and nearer the ninth than the eighth rib to avoid injury to the intercostal nerves and vessels The skin is prepared in the usual manner and a small wheal raised with the local anesthetic at the point of puncture. The subjacent tissues are then anesthetized down to the pleura. After a few minutes a rather wide bore, short bevel needle is attached to a 5 c c syringe and the needle pushed slowly into the pleural cavity. If a little negative pressure is maintained in the syringe as the needle is being introduced, fluid will at once flow into the barrel of the syringe as the pleural cavity is reached The needle should not be pushed any farther. When the syringe is full, it is detached from the needle and the fluid transferred to a sterile test tube for examination

A hundred c c. luer lock syringe with Matson's three way stop-cock is now connected to the needle in the pleural cavity and is *the ideal apparatus as it* enables one to aspirate fluid, evacuate it into a container and replace it with air or salt solution at once. As each 50 to 100 c.c. of pus is withdrawn, it is immediately replaced with air. If the pleural cavity is to be washed with normal saline, the pus is aspirated and replaced with air as each 100 c c. of pus

under the bed clothes. The oxygen consumption is from 3 to 6 litres a minute. The disadvantages of a tent are that patients often complain of stuffiness and claustrophobia and an examination without removing the tent is not easy.

PROSTATIC MASSAGE

Prostatic massage is of value both in diagnosis and treatment The patient is first asked to evacuate the bladder. He is then put in the knee elbow position and the gloved, lubricated finger is inserted into the rectum. The prostate and the vesicles are then massaged gently from the sides downwards and medially. After a minute or so drops of fluid can be collected on to glass slides which are stained and examined under a microscope.

APPLICATION OF LEECHES

Application of leeches at one time very popular, is now rarely practised It has, however, a definite value in relieving congestion and allaying inflammation and pain. The site of election is over the affected area, the liver in hepatic congestion, precordium in pericarditis with effusion, and base of lung in pulmonary congestion or pleurisy The part to which the leeches are to be applied is cleaned and moistened with sugar water; no antiseptics are to be applied. Without touching with fingers the leeches (1 to 4 or 6) are applied to the part selected If they fail to take, a small scratch with a needle will overcome the difficulty Each leech draws approximately a dram of blood and when sated falls off No attempt should be made to pull it off. If it is necessary to remove them, a little salt should be dropped on their backs when they at once drop off If further hemorrhage is needed the part, after removal of leeches should be fomented, if not a light antiseptic dressing should be applied. If the bleeding is excessive, it is checked by firm pressure or touching with a silver nitrate stick

SYRINGING THE EAR

The wax should be previously softened by instilling into the ear a few drops of the following prescription three times a day for one or two days :

Sod Bicarb	gr	15
Glycerini	. m.	120
Aq Dist.	. . ad. oz	1

The patient should be seated on a stool. A towel is fastened round his neck and a kidney tray is held beneath the ear by the patient. The auricle is pulled back by the left hand to straighten the meatus The best solution is one of two tablespoons of [illegible] to a pint of water at a temperature of 100° F. The syringe is [illegible] solution [illegible] ted upwards and any air in it is expelled. The [illegible] in the [illegible] and the nozzle points just within the meatus. [illegible] the [illegible] r. On no account sh[illegible] be [illegible] o the [illegible] d towards the dr[illegible] the wax [illegible] th [illegible] with pledgets of [illegible]

CHAPTER II

DIET

DIET IN HEALTH (ADULTS)

Fundamental considerations which should guide a person in the selection of diet are:

(a) The fuel requirement;

(b) The intake of protein;

(c) The need for vitamins and minerals

None of these factors can safely be neglected In addition attention should be given to certain other less important factors such as satiety value, roughage, ease of digestion and the economic status of the individual in relation to the cost of food.

(a) *Fuel Requirement*—The average Indian who leads a quiet life at home requires about 2,000 calories If he has a sedentary occupation 2,500 calories are required If he is engaged on light work 3,000 calories are needed For moderate work 3,500 calories and for hard labour as many as 4,500 calories may be required.

(b) *Proteins*—Many physiologists and students of nutrition agree with Chittendon that for the average man a daily intake of 50 to 60 gm of protein is proper. Sherman puts the figure a little higher, 75 gm daily The results of animal experiments and other considerations suggest that even Sherman's estimate does not allow a sufficient margin of safety and that in order to insure continued vigour and normal longevity the diet should provide daily approximately 100 gm. of good protein It is now well known that the source of protein is as important as the amount of protein needed It is necessary to provide protein mixtures which will supply all the necessary amino-acids in sufficient amounts. These are contained chiefly in milk, meat and eggs. The proteins of legumes and other vegetables, though of comparatively low biologic value are utilizable and of the greatest value when supplemented by proteins of a higher order For economy in nutrition and to insure an adequate supply of amino-acids diet should contain milk, eggs and as a rule certain amount of meat

In general an adult requires 1 5 gm. protein per kilo body weight, a child requires more, about 2 or 3 gm per kilo, for he constantly adds protein to his body structure

After the total intake and protein requirement have been determined, thought should be given to the distribution of remaining calories between carbohydrates and fats A good working formula is to allocate half the total intake calories to carbohydrates and the balance from carbohydrates and pro-

teins to fats. Fats such as butter, cream, ghee are more valuable and more easily digestible than vegetable products

(c) *Minerals and Vitamins*—Deficiency in minerals and vitamins is proportionate to the extent to which the diet is deficient in milk, fruits and vegetables. A liberal allowance of milk will take care of calcium and a generous ration of fruits and vegetables will provide sufficient vitamins and iron A child will need at least a quart of milk everyday, an adult at least a pint. The need for roughage will be met if there are enough leafy vegetables In considering the satiety values it is well to bear in mind that meats "stick to the ribs" longest. Fats such as butter and ghee and simple desserts and sweets after meals are also very satisfying.

Food should be palatable, otherwise it will not be eaten. Digestibility should also be taken into account.

If sufficient food could be provided in the country to meet above considerations (the author hopes this will be so now that the Blimps have quitted) the disease incidence will be greatly reduced and much of the chronic ill-health seen to-day all over the country will disappear.

The Vegetarian Food—That it is possible to maintain adequate nutrition on a diet of cereals, legumes, fruits, vegetables and milk, is proved by the excellent health and longevity of numerous individuals consuming this type of food. For those who have no objection it is a great advantage to add an egg or two a day

THE CHILD OF SCHOOL AGE

The nutritional requirements of the child of school age demand a special consideration His great activity requires a disproportionately large intake, his rapid growth calls for a plenty of good proteins and mineral salts and his need for vitamins is greater than that of the adults

The Total Intake—The boy or girl of 7 years requires approximately 2,000 calories daily; at 10 to 12 years 2,500 calories are required. For boys of 13 to 15, 3,200 calories are recommended, for girls 2,800. After 16 years, a greater intake, 3,800 calories is required for boys but for girls a smaller amout, 2,400 is considered appropriate. The following table from Holt and Fales gives the average number of calories intake for children of different ages:

Suggested Daily Calories

Age years.	BOYS					GIRLS				
	Average weight Kilo	Calories per			Total	Average weight Kilo	Calories per			Total
		Pd.	Kilo	Pd.			Pd	Kilo	Pd	
1	9.5	22	100	45	950	9.3	21	101	45	940
2	12.2	27	93	42	1135	11.8	26	94	43	1110
3	14.5	32	88	40	1276	14.1	31	87	40	1230
4	16.4	36	84	38	1390	15.9	35	82	37	1300
5	18.2	40	82	37	1490	18.2	40	78	36	1410
6	20.0	44	80	36	1600	20.0	44	76	34	1520
7	21.8	48	80	36	1745	21.8	48	76	34	1660
8	24.0	53	80	36	1920	23.9	53	76	34	1815
9	26.4	58	80	36	2110	26.2	58	78	34	1990
10	29.1	64	80	36	2330	28.5	63	77	35	2895
11	31.4	69	80	36	2510	31.5	69	80	36	2580
12	34.2	75	80	36	2735	35.8	79	80	36	2364
13	38.0	84	80	36	3040	40.6	89	79	36	3210
14	42.5	94	80	36	3400	45.0	99	74	34	3330
15	48.2	106	80	36	3855	48.3	106	67	30	3230
16	54.5	120	75	34	4090	51.0	112	62	28	3160
17	57.5	132	62	28	3730	52.8	117	56	25	2950
18	59.8	132	62	28	3730	52.8	117	56	25	2950
Adult	68.0	150	48	22	3265	60.0	132	44	20	2640

Protein Requirements—Children require disproportionately large amounts of proteins. During the period of greatest growth, from 12 to 15 for girls and 13 to 16 for boys, as much as 2.5 gm to 3 gm per kilo body weight may be required. The protein of child's food should be of high biologic value. Proteins of milk are most excellent in this respect Next come proteins of meat and eggs, and still lower in the scale are those of cereals, legumes and other vegetables These last, however, are readily utilized when supplemented by liberal amounts of milk

Like the adult, half the total calorie value of the food should come from the carbohydrates Carbohydrates supply energy, are the best protein sparers and from a pecuniary standpoint are most economical of food stuffs They should be taken largely in the form of milk, bread, cereals, potato and green vegetables Only a small part should be eaten as sugars, syrups and sugary foods.

2

Of what remains of the total caloric intake after taking away what is supplied by proteins and carbohydrates, is made up by fats. Fats are also essential to growth and to maintain health besides being good sources of vitamin A. They are also apparently necessary for proper digestion and absorption.

Vitamins and Minerals—To insure against nutritional failure due to vitamin deficiency, the child should take an abundance of milk (a quart daily) and liberal quantities of green vegetables and fruits.

The most important food for the child is milk and it should form the basis of his diet. This needs repeated emphasis Children must not be permitted to become indifferent to milk or to develop actual distaste for it. Milk may be given as rice pudding, custard or in other forms but some of it must be taken as such.

Cereals are excellent if taken with milk. Those cereals which must be cooked thoroughly and long (dalia, porridge) are better than more expensive flaked and puffed grains.

Eggs are valuable food for the child. They supply proteins of high biologic value, easily digested fats, iron and fat soluble vitamins, especially the anti-rachitic factor. Soft boiled, poached or shirred eggs are better than fried eggs. One egg a day is desirable.

Meats which are simply cooked are preferable to more complex croquettes and meat salads. Highly seasoned dishes should be avoided.

The fat should be given largely as butter, ghee, cream and egg yolk.

The eating of green vegetables should be insisted on. The water in which vegetables are cooked should not be thrown away. It contains valuable mineral salts and vitamins. The leafy vegetables, such as spinach, lettuce, cauliflower and tomatoes are of especial value

Fruits should be taken daily. Oranges and ripe bananas are excellent.

Variety in diet is important. Food should be eaten slowly and at regular hours.

DIET IN OLD AGE

Diet in old age does not differ materially from diet in middle age. M'clester states that man's period of productive activity can probably be extended to an appreciable degree by dietary means if the effort is begun in early youth and is a sustained one.

Within limits thinness favours longevity. Man should, therefore, endeavour to avoid the excessive weight which so often comes with advancing years. Under-nutrition must also be avoided as it lessens the aged persons' vigor and sense of well being. To enjoy sustained vigor, the aged person must have sufficient food of the right kind. The total caloric intake for an old man of 70 kilos with a sedentary occupation should be 2,500 calories, for a woman

of 56 kilos, 2,100 calories. The proteins should be relatively more liberal, 1 gm. for a kilo of body weight. Carbohydrates and fats should be taken in amounts sufficient to bring the caloric value to the proper figure but more emphasis should be laid on carbohydrates. These should contribute more than 50 per cent of the calories. The necessity for vitamins and minerals is as pressing in old age as earlier in life.

INFANT FEEDING

The most suitable food for infants is breast milk. An effort should be made to keep children on breast milk for 6—9 months afte rwhich they may be weaned. The only contra-indications to breast feeding are:

1. Grossly deficient secretion of milk.
2. *Diseases of the Mother*—Chronic nephritis, eclampsia, pulmonary tuberculosis, malignant disease, other chronic diseases, another pregnancy during lactation. During acute illness of the mother, temporary weaning is necessary, the secretion of milk being kept active by mechanical emptying of breast
3. *Diseases of the Breast*—Severe retraction of the nipple, fissure of the nipple, suppuration of the breast, malignant disease or tuberculosis of the breast.
4. The deformities of hare lip and cleft palate may be sufficiently severe to prevent suction from the breast or bottles

Food Requirements—An infant's food requirements are:

Total Intake—As a rule a healthy infant needs approximately 50 calories each day for each pound of body weight Two and a half ounces of breast milk or a suitable substitute for every pound of the body weight will supply the required number of calories. Thus an infant weighing 12 lbs. will need $12 \times 2\frac{1}{2}$ or 30 ounces of either breast milk or other mixture daily. This may be split up into six feeds a day for infants under 3 months (three hourly feeds) and 5 feeds a day for infants over 3 months (4-hourly feeds). Night feeding between the hours of 10 p.m. and 6 a m is unnecessary for healthy babies.

Protein requirement of an infant is entirely met if the proper amount of breast milk or substitute is taken.

Water—Extra water, say an ounce or two between the feeds will be needed during the summer months.

Minerals—With the exception of iron the need for minerals is met when an infant receives customary amount of milk.

Vitamins—Vitamins A and G are found in relative abundance in the milk. Vitamin B is found in the milk in small amounts but the minimum requirements are probably met. It is good practice to supply early, foods containing vitamin B_1, *e g*, egg yolk, fruits and vegetables. Vitamin C should be given as orange juice or tomato juice from early days of life. Vitamin D should be given to all infants in an amount equivalent to one teaspoon of cod liver oil daily.

Composition of Breast Milk

Protein	Fat	Carbohydrates	Ash	Water
1.25	3.5	7.5	0.2	87

Vitamins A and G are found in relative abundance; Vitamin B_1 in small amounts. If the mother is on ample diet of fruits and vegetables just enough vitamin C may be present But as a rule vitamin B_1, C and D should be given in addition.

The need for all other minerals except iron is met, if adequate amount of milk is taken. Iron should be given in additional amounts.

BREAST MILK SUBSTITUTES

Cow's milk either fresh or dried is used. The composition of fresh cow's milk is shown in the following table

Percentage composition of cow's milk (Holt)

	Protein	Fat	Lactose	Ash	Water
Cow's milk .	3.5	3.5	4.75	0.75	87
Human milk ...	1 5	3 5	7 5	0 2	87

Compared with human milk, cow's milk is more than twice as rich in protein. The proportion of caseinogen to lactalbumin is also different in the two, for while in human milk there is twice as much lactalbumin as caseinogen, cow's milk contains from 3 to 5 times as much caseinogen as lactalbumin. The easy digestibility of human milk is due to the fine curd that lactalbumin forms when compared with the large and hard curd of caseinogen. The amount of fat in cow's milk is the same as in human milk but it is not in so fine an emulsion which makes its digestion more difficult The mineral salts calcium, sodium, potassium, phosphorus are present in sufficient amount Iron is present in only small amounts and additional iron has to be given. The position with regard to vitamins is the same as in the case of human milk with this difference that the vitamin C of cow's milk is destroyed by boiling. Therefore, when an *infant is on cow's milk, iron, vitamin C, vitamin B_1 and vitamin D have to be* given in addition.

One cannot be sure of one's supply of cow's milk in this country at present. Therefore, all cow's milk before being fed to the child must be boiled.

Diluted Milk Feeding—If it is decided to put the infant on fresh cow's milk, the milk will have to be modified in most instances It is true that a few infants will thrive on whole cow's milk from the beginning, but in a great majority unless the milk is diluted it will form large and hard curds and give rise to

indigestion. At birth the mixture should be half and half, after a fortnight 2 parts milk and 1 part diluent, after four months, 3 parts milk and 1 part diluent and after six months whole milk Water, barley water and fresh whey are suitable diluents It will be necessary to add some sugar to the diluted milk If the mixture is half milk and half diluent, a teaspoon of sugar may be added to every 3 ounces. To stronger mixtures a teaspoon to every 4 ounces is enough. Feeding bottles must be kept scrupulously clean.

Acidified Milk—Either lactic acid or citric acid milks may be used. The acid coagulates the curd which is then easily digested without further modification or dilution The quantity of lactic acid usually employed is 1 teaspoon to a quart of milk and citric acid 2 teaspoons of a 25 per cent solution to the quart. The milk is first boiled, then cooled To the cold milk lactic acid is added slowly drop by drop with stirring The addition of citric acid in solution can be made more rapidly and less cautiously Acidified milk is thicker than sweet milk and requires a larger hole in the nipple

Proprietary Milks—So far as the infant is concerned the proprietary milks may be described under two heads (*a*) full cream dried milks and (*b*) humanized dry milks The infant should be put during the first three months on the humanized milk after which he should be given full cream dry milk. The dry milk is reconstituted by adding an ounce of water to a dram of the milk. The approximate caloric value of humanized milk is 16 to 18 calories per ounce, that of full cream milk is 18 calories per ounce From 2 to 2½ ounces per lb. body weight should be given in 24 hours A teaspoon of sugar should be added to each 4 ounces of reconstituted full cream milk, humanized milk requires addition of no sugar.

Common Brands of Dried Whole Milk—Ambrosia (full cream), Cow and Gate (full cream), Glaxo (full cream), Ostermilk No 2, Trufood (full cream)

Common Brands of Modified and Humanized Milks—Allenbury No 1, Allenbury No. 2, Ambrosia humanized, Cow and Gate (half cream), Dorsella (humanized) Glaxo (sunshine), Ostermilk No. 1 and Trufood (humanized).

When it is proposed to give dried acid milk, lacidac (Cow and Gate) may be given.

Other Foods for the Infants—Beginning when the baby is about 2 weeks of age, both cod liver oil and orange juice should be given. A teaspoon of cod liver oil or 400 to 600 units of vitamin D and an ounce of orange juice should be given daily. After 3 months the orange juice is increased to two ounces. Egg yolk is a good source of iron and vitamin B_1. Cooked egg yolk should be added to the food at the age of 2 to 3 months Egg yolk may also be given as custard in milk.

Vegetables and fruits are commonly fed at the age of 5 to 6 months. They should be well cooked and finely sieved. A beginning should be made with 1 to 2 tablespoons and the amount should be increased rapidly to 3 ounces daily.

Sieved cereal may be added at 6 to 7 months. The amount served should not exceed 2 ounces.

Between 8 and 10 months sieved fruit and vegetables may be served twice daily. At this stage half a slice of toast may also be given.

After 10 months instead of egg yolk, the whole egg is allowed

Feeding of Infants with Pyloric Stenosis—This malady has its onset within the first six weeks of life and is characterized by projectile vomiting, waves of gastric peristalsis visible especially after a feed and often a pyloric tumour. A considerable proportion of these babies respond well to medical treatment For the artificially fed baby the treatment consists of atropine 2 to 4 drops of a 1 in 1,000 solution before each feed and the giving of food which has been thickened by the addition of cereal or flour. If after a short period of trial these measures are found unsuccessful, the Ramstedt operation is indicated.

For the breast fed baby, operation is indicated if a suitable response to atropine does not occur; the baby should not be weaned.

DIET IN DISEASE

The importance of prescribing a suitable diet is at present not appreciated sufficiently well by the average practitioner in this country. This springs from a lack of adequate knowledge on his part of the elementary principles of dietetics. The result of all this is that unsuitable, inadequate, ill-balanced, monotonous and even harmful diets are frequently prescribed. A case in point is that of an enteric patient who is kept on milk alone, or worse still barley water, whey and fruit juices for weeks on end.

For matters of dieto-therapy as for drug and other therapy, every patient is a problem in himself It is true, certain articles are not permissible in certain conditions, but when these have been excluded, sufficient care must be given to *the patient's likes and dislikes and his food made appetising and palatable for him.*

The following diet lists are, therefore, given to supplement the discussions in the text:

Diet in Fevers

In fevers, particularly if the temperature is high, liquid diets are prescribed. In fevers of short duration it is not necessary to insist on the full caloric requirements. In fevers of long duration, an adequate caloric intake becomes most important

Infectious Fevers

Breakfast—Well cooked dalia, cooked in water for half an hour and served with milk and sugar. Tea or milk.

Lunch—Meat broth or vegetable soup.

High caloric formula.

Milk ...	... oi		
Eggs ...	... 2		
Sugar ...	... oz. 1	3-30 p m.	

Fruit juice, tea or milk 4-30 p.m.

Dinner—Vegetable or meat soup. Milk.

Plenty of water and fruit juice should be available as and when required.

Malnutrition

Deficiency of proteins can give rise to a serious state of malnutrition. This happens during war and when there is a famine. Treatment consists in feeding proteins,—milk, powdered milk, cheese, eggs, meat, fish, lentils, etc , and vitamin concentrates in large amounts.

Amino-acids orally and intravenously are valuable.

Typhoid Fever

The important point to bear in mind is that the diet should contain nothing that is coarse and likely to irritate the bowel. Liquids and soft pappy foods with no coarse particles are admirable. The following is a suitable menu :

Breakfast—Light boiled egg Milk.
10-30 a.m. Fruit juice.

Lunch—Clear soup or strained vegetable soup. Mashed potato I large size with butter and salt Sago well cooked in milk.

3 p m. Fruit juice.

5 p m. Milk or tea with bread and butter Bread should have no crusts.

Dinner—Clear soup or strained vegetable soup. Pounded fish or mashed potato Custard (thin), plenty of water, fruit juice, sherbet, etc , should be allowed. Ice-cream may be given in place of sago at lunch or in place of thin custard at dinner.

Pulmonary Tuberculosis

A number of special diets (Gerson's salt-free diet) have been from time to time recommended, but they do not seem to possess any peculiar advantage. The diet in tuberculosis should be a high vitamin, high caloric one. It should not be indigestible. It should be varied and prepared in such a manner that it is appetising.

Diets of special value in tuberculosis are milk, cream, butter, ghee, egg, orange and tomato juice. A quart of milk a day must be insisted on. Five meals a day are essential ; of these three should be major meals. The following menu may prove helpful :

Breakfast—8 a m.

Wheat or oatmeal dalia served with milk and sugar. Two eggs. Bread and butter. Cup of milk.

10-30 a m. Tumbler of milk.

Lunch—Chapati, rice, dall and vegetable curry and well cooked meat, custard.

4 p m. Tumbler of milk, fruit (preferably orange)

Dinner—Fish, rice and vegetable curry or meat curry. Sliced tomato. Chapati and curry. Ice cream or other sweet.

9 p m Tumbler of milk.

Constipation

Its incidence in urban areas is far higher than in rural areas. This is easily appreciated when the mode of living and the diet of the two types are compared. For those who suffer from habitual constipation diet should contain an abundance of water, green leafy vegetables, fresh fruit and whole meal atta. The following is as good a diet as any:

First thing on rising—Large tumbler of water.

Breakfast—Dalia with milk or cream. Fruit.

Brown bread and butter with honey. Milk

Lunch—Chapati (whole meal) Vegetables (leafy) large helping. Salad, one large plate containing lettuce, tomatoes, onions, beetroot, carrots, etc. Fruits—especially figs, prunes, dates with custard or cream.

4-30 p m.: Fruit,—oranges, mangoes or other fruit in season.

Dinner—same as lunch

Diarrhea

In acute diarrhea all food should be prohibited during the first 24 to 48 hours. Water is freely drunk. Barley water and lemon barley in water are permissible. After this weak, arrow root or cornflour are allowed. The diet is very gradually increased to normal amounts.

In chronic diarrhea, fruit, green vegetables and other foods leaving considerable residue are forbidden. A soft, smooth diet is recommended. The following is a good example:

Breakfast—A large tumbler of *matha* (Dahi to which water is added and butter removed).

Lunch—Rice well cooked. Chapati (with bran removed from the atta) Potatoes. Over-cooked dal, pounded meat. Sieved vegetables. (pulwal, loki, torai, marrow, pumpkin), custard

Ripe banana or apple.

4-30 p.m. *Matha* large tumbler.

Dinner—Same as lunch

Smooth Diet

All food should be smooth and free from tough particles, coarse fibres and high seasoning The diet is often recommended for dyspepsia, colitis, etc

Breakfast—Soft cooked egg. Corn flakes served with milk or halva. Bread and butter. Milk, tea or coffee.

Lunch—Chapati. Well cooked rice Over-cooked dal Sieved purried vegetables Mashed potatoes. Tender cooked meat, fish or fowl Custard, rice pudding (khir), Sooji, bananas, apples.

Tea—Thin slice of bread or cream cracker, tea

Dinner—Same as lunch

Sippy Diet

The diet is prescribed for gastric or duodenal ulcers and is discussed fully in the section on gastro-intestinal diseases.

Mullengracht Diet

It is recommended in bleeding peptic ulcers and is discussed also in the section on gastro-intestinal diseases

Obesity

Calories 500. Carbohydrates 32 gm Protein 70 gm. Fat 10 gm

Breakfast—Fruit juice unsweetened ½ cup.
Milk skimmed ½ cup.

Lunch—Lean meat ¼ lb. cooked weight

Vegetables (boiled) except potatoes, peas beans—2 medium helpings

Dinner—Lean meat ¼ lb. cooked weight

Vegetables as at lunch.

Vitamins—2 capsules of esdavite (Sharpe and Dhome) or vigran (Squibbs) daily.

Reducing Diet No. 2.

Calories 960. C. 80 gm.; P. 70 gm.; F. 40 gm.

Breakfast—Fruit—1 serving.

·Cereal (dry before cooking) 1 tablespoon
Bread ... 1 slice
Egg ... 1
Skim milk ... 1 cup

Lunch—Lean meat, fish, or fowl	...	1 small serving (2 oz.)
or cheese	...	1 small slice
or cottage cheese	...	2 heaping tablespoons
or eggs	...	2
vegetables	...	2 generous servings
skim milk	...	1 cup
fruit	..	1 serving
Dinner—Lean meat, fish or fowl	...	¼ lb. (cooked)
or cheese	...	2 oz.
Vegetables	...	2 generous servings
Fruit	...	1 serving

Vegetarians can take a small helping of boiled dal in place of meat, fish or fowl.

Bread *in any form is a taboo.*

Tea sweetened with saccharin is permissible.

A fruit serving means any one of the following: 1 orange, 1 pear, 1 peach, *1 small apple, 1 small banana, 2 slices of melon or muskmelon, 2 slices of* papita.

Two poly-vitamin tablets a day should be taken.

Gout

A low purin diet is indicated. It is important to eat in moderation.

Breakfast—Fruit, cereal with milk and sugar. White bread. Eggs. Skim milk.

Lunch—vegetable creamy soup *Boiled chicken, mutton or fish not* more than twice weekly. Eggs and cheese in moderation. Vegetables, except as noted below. *Bread, chapati, rice, macaroni, fruit* pudding or cake. Milk, fruit juice.

Dinner—Same as lunch.

Avoid sweet-bread, liver, brains, sardines, mushrooms, condiments, gravies, meat soups, whole grain products, asparagus, cauliflower, peas, beans, spinach, butter, cream, and mayonnaise.

Diabetes

The diet in diabetes is considered later under its appropriate head. The following diet from Cutting contains approximately 2,062 calories.

Calories 2,062

C. 220 gm.; P. 93 gm.; F. 90 Gm.

Breakfast—Fruit	...	1 serving
cereal	...	3 tablespoons (dry measure before cooking)
milk	...	1 cup
bread	...	1 slice
butter	...	1 pat
egg	...	1

Lunch—Meat, fish, or cheese or eggs—1 small serving (2 oz.)

Vegetables (raw or cooked)—1 generous serving

bread	...	2 slices
butter	...	2 pats or 4 teaspoons
fruit	..	1 serving
milk	...	1 cup

Dinner—Lean meat, fish or fowl ¼ lb. (raw), potato, 1 medium or bread 2 *slices, vegetable (raw or cooked) except corn, peas, beans,* 1 generous serving.

Butter	..	2 pats, or 4 teaspoons
Fruit	..	1 serving

One serving fruit: 2 oranges, or 1 cup juice, 7 apricots, 1 large peach, an apple, 1 pear, 30 cherries, 1 banana.

Karrel Diet

Karrel diet is indicated in decompensated heart disease during the first three or four days of treatment. It consists of four feeds of 7 ounces of milk throughout the day. No other fluids or solids are allowed

Rice Diet

Kempner has recently introduced in the treatment of hypertensive vascular disease, acute and chronic glomerulo-nephritis, chronic pyelonephritis, polycystic kidney disease and nephrolithiasis a rigid diet consisting of rice, sugar and fruit juice. He reports a reduction in blood pressure, decrease in heart size, improvement in the eye-grounds and electrocardiographic tracings and a decrease in non-protein nitrogen concentrations in the blood. The diet must be strictly adhered to for weeks

Six and one-half to ten ounces of rice are taken daily Rice may be boiled or steamed in plain water or fruit juice, without salt, milk or fat. In addition, 700 to 1000 c.c. of fruit juices are permitted (no water). All fruits are permitted with the exception of nuts, dates, and any dried or canned fruit, or fruit derivatives to which substances other than sugar have been added. No salt is permitted. All fruit juices are permitted, but tomato and vegetable juices are not. Brown or white sugar may be used as desired. The program must be

continued indefinitely. Supplements of multi-vitamins and iron are necessary because of obvious deficiencies in the diet.

Ketogenic Diets

Once very popular in urinary infections, ketogenic diets are now rarely used for this purpose. Ketogenic diets are also used for preventing epileptic seizures in children With the introduction of epanutin as an anti-convulsant they have fallen into disuse.

Nephritis

In acute nephritis a low protein (10 Gm), low salt diet is indicated. The diet has been considered under its appropriate head. In chronic nephritis with edema, as the plasma proteins are low, a high protein diet, and injections of plasma and amino-acids are indicated In chronic nephritis without edema high protein diets are not indicated, but the protein intake should not be less than $\frac{2}{3}$ Gm. per kilo body weight In chronic nephritis with edema fluids and salt must be restricted.

Hepatic Disease

The diet in hepatitis and cirrhosis should be high protein, high carbohydrates, low fat and rich in vitamins. The amino-acid treatment of liver disorders has been considered in the section on Recent Progress in Drug Therapy and in the section on Gastro-intestinal Diseases.

CHAPTER III

TREATMENT OF COMMON SYMPTOMS

VOMITING

Vomiting is a symptom in many diseases. Where treatment of the causal condition does not relieve it quickly, symptomatic measures are necessary. In most cases food and fluids by mouth should be withheld The following measures are often of help:

1. Sodium bicarbonate 15 to 60 grains in water.
2. Spirit of peppermint 15 minims in an ounce of water.
3. Calomel gr 1/12 combined with sodium bicarbonate 5 grains, given every quarter of an hour for six doses.
4. Liquor adrenalin 1-1000, ten minims in an ounce of water.
5. Sedatives, particularly barbiturates may be useful. Phenobarbital or sodium phenobarbital 1½ grains by mouth is suitable. If vomited immediately, the dose may be repeated by rectum or sodium phenobarbital given intramuscularly
6. *In severe and prolonged vomiting 5 per cent glucose saline should* be given intravenously morning and evening
7. If nausea or vomiting is the result of motion sickness (car, train, sea or air-plane) the drug of most value is hyoscine hydrobromide The dose is 0.4 to 0 6 mg every 4 to 6 hours

Anti-histamine drugs (dramamine 50 to 100 mg) appear to be of marked benefit

FLATULENCE

The following symptomatic measures are of value and may be tried.

1. A carminative mixture every 4 hours
2. Ol Cajuput m 3 every 4 hours
3. A rectal tube passed and left *in situ* for 1 hour
4. Turpentine stupes.
5. Turpentine enema It gives relief if no contraindication to its use exists
6. Pitressin ½ to 1 c c or neostigmine 1 c c. (1 in 1000 solution) or carbachol or doryl every 4 hours, parenterally.

7. Fifteen per cent salt solution 50 c.c. intravenously.

8. Fifty per cent dextrose 50 c.c. intravenously.

9. As a last resort spinal anesthesia using procaine which removes symptomatic inhibition of motility.

If after a reasonable trial of above measures, no relief is obtained, a surgeon must be consulted without further loss of time.

HICCUP

Hiccup may be a symptom of many different conditions. The measures used to control it are:

1. Carminatives.

2. Holding the breath.

3. Traction on the tongue for ½ to 1 minute.

4. Breathing from a paper bag or inhaling carbon dioxide from a sparklet resuscitator. This is often very effective Carbon dioxide may be inhaled from 5 to 15 minutes every 1 to 2 hours.

5 Amyl nitrite inhalations

6 Amphetamine in doses of 10 to 20 mg. for 2 or 3 doses at intervals of 4 hours. Amphetamine may also be inhaled

7. Trasentin 2½ grs by mouth or ¾ to 1½ gr. subcutaneously is also effective.

HEMATEMESIS

The following measures are recommended :

1. Rest in bed in Fowler's position.

2 Morphine ¼ grain hypodermically to allay restlessness and anxiety.

3 *Alkalies*—A teaspoon of the alkaline powder is given 4 times a day

4. Iron and vitamin C are prescribed in adequate amount as soon as the bleeding has stopped

5 If there is collapse, warmth should be applied and physiological saline (2 pints) given subcutaneously. This should be followed by blood transfusion (200-300 c.c.) if the shock is not rapidly controlled. A blood transfusion is also advisable if the hemoglobin is below 50 per cent.

6. *Diet*—On the first day the patient is given 3 pints of milk with 3 beaten eggs added to it, eight ounces being given every 3 hourly.

If the patient feels thirsty the milk-egg mixture may be given immediately after hematemesis. If the patient does not wish to take the mixture, it should not be forced on him. He can take water instead. On the second day the same diet is permitted. On the third day if there has been no further bleeding, jelly, eggs and custard are added.

7. Operative interference is inadvisable except in cases of intractable bleeding from a large eroded artery in the base of the ulcer.

COUGH

Cough may result from disease of the upper air passages or from diseases affecting the tubes or the lung parenchyma itself. In each case it is important to determine the cause, before appropriate treatment can be prescribed. Cough may be productive or unproductive. In unproductive dry cough, any of the following preparations may be prescribed with benefit.

1. Elixir of terpin hydrate 1 dram every 2 or 4 hours
2. Elixir of terpin hydrate with codeine 1 dram every 2 or 4 hours.
3. Sedatole (Sharpe and Dhome) one to two teaspoons every 2 or 4 hours.
4. Cosylan (P. D. & Co.)
5. R Syrup Tolu
   Oxymel Scilla
   Tinct. Camph. Co āām 20
   Every 2 or 4 hours.
6. Syrup Codeine Phos one to two teaspoons every 3 or 4 hours
7. R Syrup Codeine Phos. .. . ... m. 20
   Glycerine .. .. m. 20
   Succi Limonis ... ... m. 18
   Spirit Chlorof. ... . m. 2

To be given when cough is very troublesome.

In the early stages of bronchitis when there is soreness on coughing but little secretion the following mixture is of great value:

R
Sod. Chlor. ... ... gr. 5
Sod. Bicarb. ... ... gr. 10
Spirit Chlorof. ... ... m. 5
Aq. Anisi ad ... ... oz. 1

Sig: In a cup of very hot water to be sipped slowly, three or four times a day.

When secretion is present in the bronchi but is expectorated with difficulty one of the following mixtures will do:

℞

Ammon. Carb.	...	...	... gr. 5
Tinct. Nuc. Vom.	...	...	... m. 3
Spirit. Chlorof.	...	...	... m. 5
Infus. Quassiae ad	...	...	... oz. 1

Every 4 hours.

℞

Pot. Iod	...	...	... gr. 7
Ammon. Carb.	...	...	... gr. 5
Spirit Chlorof.	...	...	... m. 5
Aq. ad	...	...	... oz. 1

Three times a day.

When spasm is present in addition, an antispasmodic expectorant is indicated

℞

Pot Iod.	...	...	... gr. 5
Tinct. Strammon.	...	...	... m. 5
Extract Glycyrrhizae Liq.		...	... m. 30
Spirit Chlorof.	...	...	... m. 5
Aquam. ad	...	...	... oz. 1

Three or four times a day.

A suitable proprietary preparation is Phedros Cough Syrup (Sharpe and Dhome).

HEMOPTYSIS

The commonest cause of hemoptysis is pulmonary tuberculosis. The next most frequent cause is decompensated mitral disease of the heart. The writer has seen quite a few cases with hemoptysis due to mitral disease in adolescent girls in whom a diagnosis of pulmonary tuberculosis had been made. Hemoptysis may also result from bronchiectasis, new growth of the lung and various other lesions. Hemoptysis in the absence of any detectable lesion of the lung is almost always due to pulmonary tuberculosis.

Treatment—The patient should be propped up in a semi-recumbent position and if it is known from which side the blood is coming he should be inclined slightly to that side. An injection of ¼ grain of morphine is given to quieten the patient. Bandages should be applied to the thighs for half an hour and sufficient pressure applied to obstruct the venous but not the arterial circulation. Thereafter bandages may be applied to the upper arms for another half hour. If the bleeding is very severe and the side from which the blood is

coming is known, an attempt should be made to collapse the affected lung. Usually 500 to 800 c.c. of air are required to check the hemorrohage. Cough should be allayed by a sedative linctus such as Cosylan (P. D. & Co.). Other measures that may be tried are: inhalation of amyl nitrite 5 minims; injection 5 c.c. of coagulen (Ciba) t.d.s.; intravenous injection of 10 c.c. of 10 per cent calcium gluconate; or the daily injection of 1 grain of emetine chloride for 5 or 6 days A 1 per cent solution of congo red in 10 c c. dose has also been recommended to be given intravenously.

All food should be taken cold. A saline aperient (mag sulph 120 grains in water) should be given. If there is deficiency of vitamin C or P or K, ascorbic acid, hesperidin or kapilon respectively should be given in adequate dosage.

ANURIA

As anuria may be pre-renal, renal or post-renal, its treatment will depend upon which type is present in a particular case.

Pre-renal Anuria—Pre-renal anuria is due to a fall in blood pressure below that point where excretion of urine is possible. Its treatment is similar to that of anuria occurring in cholera and is described under that heading

Renal Anuria—There is failure of the renal epithelium to secrete urine and efforts should be directed to kindling the renal activity. The measures usually adopted are intravenous administration of 5 per cent dextrose, warm high colonic douches, hot applications, such as hot water bottles or electric pads to the loins and the use of such diuretics as will not damage the renal epithelium The best diuretic according to Hamilton Bailey is an isotonic solution of sodium sulphate made up by dissolving 42 85 G of sodium sulphate in a litre of water and given as drip. There is no excuse for allowing more fluid by the vein than is necessary. Until a corresponding output of urine is recovered, the volume of sodium sulphate solution injected should not exceed half to three quarter pints.

When the amount of blood urea is very high (200 mg or more), two pints of blood are removed by venesection and while this is going on, one to one and a half pint of plasma injected into the vein on the other side of the body.

When the above measures fail to produce results in 9 to 12 hours, as a last resort half a pint of five times concentrated serum can be injected intravenously.

Obstructive Anuria—In unrelieved obstructive anuria, diuretics and intravenous infusion of pints of fluid is absolutely contra-indicated When the obstruction has been remedied, diuretics and fluids are permissible For the rest the treatment does not differ from that already described.

DELIRIUM

Delirium may occur as a complication of many diseases, acute infections, thyrotoxicosis, heart failure, alcoholism and injury. The chief indications are the

treatment of the causal condition, prevention of physical harm to the part and avoidance of fatigue, starvation and dehydration.

The room should be darkened and the patient put in charge of a tactful, understanding nurse. Fluids are given in liberal amounts both by mouth and parenterally. Nutrition is maintained by giving milk, fruit juices and glucose in generous quantities. Hydrotherapy is valuable and baths at a temperature of 99°F to 100°F, given for ½ to 1 hour are usually calming. If more is needed sedatives like paraldehyde 2 to 4 drams by mouth or sodium amytal 5 grains intramuscularly may be given.

CONVULSIONS

Convulsions may occur in the course of fevers, intracranial disease, certain cardiac conditions, toxemias, poisoning, metabolic disturbances, tetanus, hydrophobia, tetany, parasitic infestations and epilepsy.

The treatment consists of general measures during the fit, and sedation and, investigation and removal of the cause if possible later.

The general measures consist in the provision of a padded tongue blade between the teeth and preventing the patient from injuring himself.

Suitable sedatives to select from are:

Potassium bromide	30 gr.	By mouth.
Phenobarbitone	1 to 1½ gr	By mouth.
Chloral hydrate	30 gr.	By mouth.
Paraldehyde	dr. 2-6	By mouth.
Morphine sulphate	¼ gr (Subcutaneously).	
Paraldehyde ½ to 1 fluid ounce in 100 c c of Physiological saline		By rectum.
Tribromethanol 40 to 80 mg per kilo		By rectum.
Sodium gardenal	1½ to 3 gr	Intramuscularly
Sodium Amytal	3 to 5 gr	Intramuscularly

For women and children proportionate doses should be used.

INSOMNIA

Insomnia may result from psychological causes, such as unsolved day-time problems, fears, worry, etc , or from physical ailments, such as pain, cough, flatulence or nocturia.

Treatment—The physical causes, if any, should be treated by appropriate measures: pain by analgesics, cough by suitable mixtures and flatulence by charcoal or carminatives. If the causes are psychic, suitable psychotherapy should be employed, the patient should be assured that insomnia is not detrimental to health and does not conduce to insanity. He should be told that sleep, when it is absolutely necessary, is impossible to resist and that lying quietly in bed gives as much physical rest as full sleep. Various devices to

induce sleep, *viz*, reading a difficult and abstruse book, listening to a monotonous sound as the tick-tack of a clock or counting sheep, may be tried.

Suitable directions with regard to type of bed, amount of bed clothes, warmth, ventilation, darkness of the bed room, exercise, baths, day-time naps, and evening food and drinks, should be given.

During the period of readjustment, hypnotics may be necessary. They should not be given over long periods and should be varied from time to time. Paraldehyde, carbromal, medinal, dial, and phenobarbitone are suitable preparations to select from

PAIN

The relief of pain is a physician's most important task and the physician who knows it and does all he can to relieve pain, naturally gains the confidence of his patients The physician who neglects to relieve pain promptly does so to his own cost.

Of the many drugs recommended, some are potentially dangerous. Acetanilid and acetophenetidine may give rise to methemoglobinemia, amidopyrine to agranulocytosis and sedormid to thrombocytopenia. Among the safer analgesics which may be repeated every 4 hours are acid acetyl salicyl 5 to 10 gr. by mouth, codeine sulphate ½ to 1 gr by mouth or subcutaneously and morphine sulphate ⅛ to ½ gr by mouth or subcutaneously Other opiates which may be used are dilaudid gr 1/30 subcutaneously and eukodol orally or subcutaneously. Dilaudid and eukodol do not give rise to nausea and vomiting which often follow the use of morphine

As opium and morphine are likely to give rise to habit formation, caution is necessary in their use In incurable disease, however, opiates may be used in amounts large enough to keep the patient free of pain and little care is taken to prevent habit formation

Recently cobra venom has been used intramuscularly for relief of pain. Five mouse units are injected on the first day, after this 10 to 20 mouse units are injected daily till relief of pain occurs. Nausea and other toxic symptoms limit its usefulness Cobra venom has not come into wide use as in many instances it does not relieve pain satisfactorily

Of the physical methods of relieving pain, mention must be made of local heat, infra-red rays, short-wave diathermy and irradiation

When none of these measures succeed resort may be made to injection or resection of nerves or chordotomy

CHAPTER IV

PHYSICAL THERAPY

LIGHT THERAPY

Light therapy may be defined as treatment by means of light rays, particularly invisible light rays

Light is described as an electro-magnetic disturbance of ether which occurs in the form of oscillations or waves The quality of the radiation depends upon the length of the waves measured from crest to crest. The unit of measurement of these waves is the Angstrom unit (A) which is one ten millionth of a millimeter. The shortest rays are the cosmic rays with wave lengths almost infinitesimal and shorter than the wave length of the shortest gamma ray, which is 1/100 of an Angstrom unit. The longest rays usually included in graphs of the electro-magnetic spectrum are the hertzian waves used in radio *transmission and wireless telegraphy From the shortest to the longest the* known wave lengths are

	A.
Gamma rays of radium	01-.1
Roentgen rays	.1-500
Ultra-violet rays	1,000-3,900
Violet rays	3,900-4,300
Blue rays	4,300-5,000
Green rays . . ... / ..	5,000-5,600
Yellow rays	*5,600-5,900*
Orange rays	5,900-6,200
Red rays	6,200-7,700
Infra-red rays	7,700-1,20,000
Hertzian waves / Alternating current waves }	up to 12 kilo-meters.

The rays which we will consider under light therapy vary in wave lengths from 1000 A. U (short ultra-violet rays) to 150,000 A. U. (long infra-red rays). The rays in this region of the spectrum have varying physical properties and physiological effects; the ultra-violet rays produce chemical changes in the body tissues, the infra-red rays produce only superficial heating effects. In the ultra-violet portion of the spectrum the band of rays between 2,900 and 3130 A. U. is called the vital ultra-violet band and is used for antirachitic effect; below 2,800 are ultra-violet rays which are chiefly bactericidal and abiotic In the infra-red portion of the spectrum, the near infra-red rays are the most penetrating heat rays. In selecting an apparatus, therefore, it is very important that the source of radiation employed should produce a large amount of rays actually required for the particular condition to be treated.

Sources of Light Therapy—Although numerous sources of light therapy are described in books on physical therapy only four will be considered here :

1. Sun
2. The Carbon Arc
3. The Quartz Mercury Arc.
4. The Infra-red Radiators.

The Sun—The Sun is the only source of natural light Its utility is, however, limited by a number of factors The ultra-violet content of Sun's rays varies with the time of the day, with the altitude of the locality, with the geographic position and latitude, with the time of the year and with the amount of dust, smoke and water vapor in the air In this country the heat rays of the Sun are so powerful during summer months that except in the hills, no use can be made of the therapeutic rays of the Sun An artificial source of light is, therefore, to be preferred to the natural sunlight When, however, it is desired to make use of the Sun's rays, a solarium should have a light room in addition, so that during unfavourable weather conditions the artificial source of light can be used to carry on the treatment

2. *The Carbon Arc*—The carbon arc lamp consists of one or more pairs of rod-like carbons arranged end to end in a vertical or horizontal position. Next to Sun with a surface temperature of about 5,500°C, the carbon arc is the hottest artificial source of radiation (surface temperature of positive electrode, 3,300°C). Radiation from the carbon arc lamps varies with the amount of current used and the type of carbon which is employed As a general rule, high amperage arcs (30 amps) are more efficient than the low amperage arcs (5 to 10 amps.) in the production of ultra-violet radiation The carbon used may be a natural-core or almost pure carbon, or one with an impregnated core We have thus a natural core-carbon with maximum radiation in the cyanogen band (3890A), a blue flame carbon with radiation most like that of mercury vapor lamp (radiation of wave lengths of less than 3100A exceeds that in all other arcs) a red flame carbon with radiation approaching most nearly that of tungsten filament lamp (intense emission between 5,000 to 7,500A), a yellow-flame carbon with considerable radiation between 2,900 to 3,200 A U and screened with corex D glass produces a radiation which almost approaches that of sunlight.

The disadvantages of the carbon arc lamp are

1. The carbon electrodes are continually being consumed and must be adjusted and replaced
2. A large amount of current is required to operate the lamp efficiently.
3. Carbon arc lamps are very hot at close range and fumes, sparks and ash are produced which need to be disposed of

As opposed to these disadvantages, carbon arc lamps have number of advantages. These are :

1. Different types of carbons may be used and various portions of light spectrum produced at will.

2. Carbon arc supplies a continuous spectrum throughout the ultra-violet, visible and infra-red rays.

3 The initial expense of the lamp is low.

3. *The Quartz Mercury Arc*—The quartz mercury vapor arcs are of two types, the hot quartz lamps and the cold quartz lamps.

The so-called cold quartz ultra-violet lamp is essentially a low vapor pressure, low amperage, high potential, glow discharge, similar to the Geissler tube. Of the total radiation of all wave lengths shorter than and including the line at 3,132A more than 95 per cent is contained in the emission line of mercury vapor at 2537 angstroms For this reason the cold quartz is not considered a very suitable source of light for the general body irradiation. The lamp is of use clinically in the treatment of skin diseases and for local lesions of the nose and throat. Two types are marketed, a grid type for irradiation of the body and an orificial type consisting of a hollow rod of quartz for insertion into various body cavities.

The Hot Quartz Lamp—There are two varieties, the air cooled hot quartz lamp and the water cooled Kromayer. The former is used for general irradiation, the latter for treatment of local conditions. Some air cooled hot quartz lamps have windows for local irradiation.

The quartz mercury arc lamps may have a solid tungsten anode or a liquid mercury anode. There is no appreciable difference in the ultra-violet component radiation emitted by these two lamps. Recently new types of hot quartz lamps have been introduced. These are the Mazda S-1 and the Mazda S-2 "Sunlight Lamps" being a combination of an incandescent tungsten filament and an arc in mercury vapor between highly incandescent electrodes of tungsten.

The mercury vapor arc is used extensively as the most suitable source of ultra-violet radiation for routine therapeutic applications.

4. *The Infra-red Radiators*—There are two types, the incandescent ones enclosed in glass bulbs and the non-luminous ones consisting of an electrically heated solid rod, or a resistance wire embedded or wound on an electrically non-conducting refractory material. The incandescent ones emit radiation of wave lengths between 5,000 and 10,000 angstroms with the maximum emission at from 11,000 to 20,000 angstroms depending on the temperature of the filaments The tungsten filament lamps are a little superior to the carbon filament lamps and both these types are better than the non-luminous heaters, as they produce radiation, about 30 per cent of which can penetrate the skin as deeply as any light rays The non-luminous infra-red generators, *i e*, those not enclosed in glass bulbs emit perceptible radiations of all wave lengths throughout the infra-red to 160,000 angstroms. As the radiations they emit are not penetrating in their effect they are not as good sources of infra-red rays as the luminous generators In fact a non-luminous generator has no peculiar advantage, so far as the infra-red rays are concerned, over an ordinary household electric heater.

Physiologic Effects—The physiological effects of ultra-violet rays (Summary by Krusen) are:

1. Chemical effects.
2. Photochemical effects (activation of substances in the skin and possibly in the blood).
3. Biologic effects (stimulation of metabolism, cellular activity, growth and circulation).
4. Prevention and cure of rickets (in wave-lengths shorter than 3,150 angstroms)
5. An antirachitic potency in fats, milk, ergosterol, oil and vegetables (in wave lengths shorter than 315 angstroms).
6. Delayed or latent erythema of the skin of human beings
7. Diffuse pigmentation of the skin in fair skinned people after a few erythema doses (this pigmentation probably assists in the absorption of light energy which is transformed into heat).
8. Improved tone, color and elasticity of the skin and presumably increased secretory and protective powers of the skin.
9. Activation of an impurity in cholestrol (normally present in the skin of human beings) to form vitamin D which in turn stimulates absorption of calcium and phosphorus from the intestinal tract and increases metabolic efficiency (Phytosterol of plants is similarly activated).
10. An increase of the active oxygen content of the lipids of the skin with an increase in their bactericidal action.
11. Possible activation of useful cutaneous reflexes.
12. Possible formation of hormones in the skin.
13. An increase on general exposure in the number of erythrocytes, leucocytes, blood platelets and hemoglobin of the circulating blood, and a decrease in the hydrogen ion concentration, coagulation time and eventually in the blood volume.
14. A possible increase in the bodily resistance by increasing the bactericidal power of the blood.
15. An increased carbon dioxide tension and relative alkalosis (in moderate doses); a decreased carbon dioxide tension and acidosis (in heavy doses).
16. A lessening of toxicity of the serum of the patient who has pernicious anemia.
17. An increase in serum globulin.
18. A transient lowering of blood pressure.
19. Possible activation of circulation by dilating capillaries and continuous tonic action on the sensory nerve endings in the skin.
20. Increased permeability of all membranes and capillaries.

21. Presumably stimulating effects on the human body (if rays are larger than 290 mu.).
22. Lethal effects on the cells of human body if the rays are shorter than 290 mu. and in large quantities.
23. An improvement of muscular tone.
24. An increase in protein and mineral metabolism (with an increase in the urinary output of nitrogen, phosphorus sulfur and chlorides).
25. A possible lowering of sympathetic tone.
26. Possible stimulation of intracellular oxidation.
27. Possible increase in the rate of bodily growth.
28. An increase in the ability of the organism to utilize more effectively materials which are present but are not available (but does not act as a substitute for dietary deficiencies).
29. A decrease in the rate but an increase in the depth of respiration.
30. An antirachitic potency of the milk of cows or of pregnant or nursing mothers
31. A bactericidal action.

Physiological effects of infra-red rays (Summary by Krusen) are:

1. Thermal action.
2. Biologic effects (on metabolism, cellular activity, growth and circulation)
3. Immediate erythema.
4. Mottled pigmentation of the skin after repeated long exposures.
5 Visual effects.
6. Psychic effects
7. Possible "mildly curative" effects on wounds
8 Possible useful cutaneous reflexes.
9. A rise of temperature of considerable volume of blood as it circulates through the cutaneous capillaries to a degree exceeding the average fever temperature, without there being an appreciable rise in bodily temperature
10. Increase of alkalinity of the blood and also probably of the tissues (due to loss of fatty acids, lactic acid and carbon dioxide)
11. Changes in the cellular elements of the blood when used in conjunction with ultra-violet radiation.
12. Possible activation of circulation by dilating capillaries and producing a "tonic action" on the sensory nerve endings in the skin.
13. A transitory drop in blood pressure (due to dilatation of peripheral capillaries and loss of body fluids).
14. An increase in pulse rate.
15. Possible stimulation of intra-cellular oxidation.

16. Diuresis.
17. Hyperpnea.
18. Loss of body fluids (through over-ventilated lungs, increased perspiration and increased urinary output).
19. Transitory loss of weight
20. Elimination of salts (ammonia, uric acid, amino-acids, creatinine, phosphates and sulphates are eliminated through the sweat The amount of salts excreted in the sweat may be 10 times that normally excreted in the feces
21. Elimination of carbon dioxide.
22. Local hyperemia, sweating and relaxation of muscles

Dosage of Ultra-violet Rays—When deciding the dosage two laws should be carefully borne in mind. These are the inverse square law and the cosine law.

The Inverse Square Law—The intensity of radiation from any source of light varies inversely with the square of the distance from the source For example, if the distance is 40 inches and is reduced by half, *i e*, 20 inches, the intensity of radiation will be four fold Similarly, if the distance is diminished to one-fourth, the intensity will increase 16 times

The Cosine Law—The energy per square centimeter is proportional to a constant multiple by the cosine of the angle made by a line connecting the source and the patient, and a line perpendicular to the patient's body. The constant is the light per square centimeter when the patient is perpendicular to the line joining the light and the patient Thus maximum intensity is obtained when the part to be radiated is at right angles to the source. As the direction of the rays becomes more and more oblique, the intensity of radiation diminishes When the rays strike a part at 30°, twice the length of exposure is necessary to produce the same effect of radiation as at a right angle.

The dosage of ultra-violet rays varies with the source of light, the complexion (fair, medium or dark) of the patient and the age of the burner. A simple method of determining the dose in any individual case is to make use of the sleeve test A sleeve made out of long cloth has ten holes cut into. Each hole has a piece of tape sewn close to it so that it can be covered at any time. The sleeve is worn on the forearm of the individual for whom the dosage is to be determined. The source of light is put at a specified distance, say 10 inches. The apertures are kept uncovered and the forearm is in the direct line of the source. Beginning at one end, one of the holes is covered by its tape every 15 seconds. Thus the skin beneath the first opening is exposed for 15 seconds, that beneath the second for 30 seconds and so on, the last area of the skin being exposed to the rays for 2½ minutes. After 24 hours the forearm is examined and the amount of erythema in each area noted.

For systemic irradiation usually sub-erythema or minimum erythema doses are given, for local therapy it is customary to produce a more marked erythema.

Technic of Ultra-violet Irradiation

General Irradiation—This is done by Rollier's method in which Sun's rays are made use of, or by one of the lamps described earlier in this section.

Rollier's Method—With the exception of the head which is protected at all times the rest of the body is gradually exposed to the Sun's rays. On the first day, only the feet are exposed, front and back, each for 5 minutes. On the second day the feet are exposed for 10 minutes and the legs below the knees for 5 minutes, front and back. On the third day the feet are exposed for 15 minutes, the legs below the knees for 10 minutes and the thighs for 5 minutes. On the fourth day the abdomen and the lower back are included and the day after, the chest, front and back, in a similar manner. The time of irradiation is gradually increased, each part of the body being exposed for 5 more minutes each day till the fifteenth day. After this the same dose is repeated daily.

General Irradiation by Quartz Mercury Vapor Lamp—For general irradiation an air cooled lamp is employed The burner is not touched by fingers; is usually cleaned by carbon tetrachloride or pure ethyl alcohol. The reflector should be clean and well polished. The lamp is so placed that the burner is nearly perpendicular to the surface to be irradiated and at a distance of 30 to 36 inches The hood enclosing the burner is not opened unless the burner has warmed up The operator's, the patient's and the attendant's eyes should be protected by goggles In the case of the patient it is perhaps better to place a small pledget of moistened cotton over each eyelid. Adults are usually exposed in four areas at each session, the upper half and the lower half of the body, at first front then back. In some cases a fifth exposure is made on the region of the disease In infants and young children only two exposures are made at each treatment,—one over the front and one over the back.

The usual way is to administer either a S. E. D. (sub-erythema dose) or preferably a M. E D. (minimal erythema dose) at the first session Doses are repeated at intervals of 3 or 4 days and the dose is increased each time by the same or a smaller amount. A series consists of 10 to 15 such treatments

General irradiation with a carbon arc lamp is carried out in the same manner as with an air cooled mercury vapor lamp.

Local Irradiation—Local irradiation is best carried out by the water-cooled type quartz mercury vapor lamp (Kromayer lamp). A quartz rod, disc or other suitably shaped applicator is brought near or into contact with the local lesion or an applicator may be introduced into an orifice. As the source is very close to the part to be treated, the intensity of irradiation is very great. The dosage or length of exposure has therefore to be very small. As with air cooled lamps for general irradiation, the dosage for the Kromayer is determined by the usual cutaneous test. The apertures in the sleeve are, however, taped after a much shorter exposure (5 seconds or less)

Some technicians consider that better results are obtained when the applicator is applied to the lesion with sufficient compression to produce ischemia of the underlying skin or mucous membrane. This method is designated as

local irradiation with compression Local irradiation may also be performed by a carbon arc lamp or cold quartz lamp

Combined Local and General Irradiation—In some cases (lupus vulgaris) it is a great advantage to combine general and local irradiation.

Dosage of Infra-red Rays—The source of infra-red rays, if it is of the usual cup shaped reflector type is kept at a distance of 18 to 24 inches from the part to be treated. The length of exposure depends upon the amount of erythema produced Usually it lies between 30 and 45 minutes. Caution is necessary in treating extremities with impaired circulation and anesthetic areas of skin A useful rule is to increase the distance or decrease the heat if this becomes uncomfortable.

Indications

Indications for Ultra-violet Rays—Gastro-intestinal Diseases Ultra-violet rays have proved of great value for tuberculous peritonitis and enteritis The *treatment should be carried out in accordance with the principles laid down by* Rollier. Rest, fresh air, high vitamins and soft diet and pneumoperitoneum are other parts of the treatment Ultra-violet rays are best given by the fractional technic. The body is divided by the waist line front and back into four parts Each part is irradiated successfully in such a manner that no part receives treatment oftener than once in ten days Treatments are given three times a week Rollier's method is advocated if sunlight is to be used and Mayer's technic for general irradiation, if mercury vapor lamp is to be used.

Circulatory Diseases—Combined with rest, a suitable diet, iron and liver, it is a useful adjunct in the treatment of secondary anemia It decreases the clotting time of the blood and may have a little value as an adjunct in the treatment of hemophilia. It lowers hypertension but the effects are temporary.

Respiratory Diseases—Beneficial effects have been claimed for ultra-violet rays in the treatment of bronchial asthma, pertussis, pneumonia, and in the prevention and treatment of common colds, but confirmation is lacking There has been great controversy regarding the use of ultra-violet rays in the treatment of pulmonary tuberculosis The present opinion appears to be that minimal, moderately advanced and even far advanced cases may benefit by gradual exposure provided that the patient's temperature does not exceed 99 5°F and the general condition is satisfactory A history of hemoptysis is not a contra-indication Patients with far advanced, toxic or advancing active, exudative pulmonary tuberculosis, should not be treated with light therapy

Diseases of Bones, Joints and Muscles—Light therapy in conjunction with other measures (braces, operative interference, plaster casts) is of immense value in the treatment of bone and joint tuberculosis Both general and local irradiation should be exploited *In rickets light irradiation is the quickest,* the most effective and the most direct method of treatment. It is better than oral administration of cod liver oil or irradiated ergosterol. It is advisable to administer clacium in conjunction with ultra-violet radiation. It is also said to be of value in osteo-malacia, fragilitas osseum, delayed union of fractures,

spasmophilia and tetany. Excellent results have been recorded following combined local and general irradiation of osteomyelitis and tubercular sinuses. A number of authors have claimed beneficial results for ultra-violet rays in the treatment of atrophic, hypertrophic and psoriatic arthritis.

Skin Diseases—Ultra-violet irradiation acts specifically on lupus vulgaris when the treatment is strictly on Finsen principle. Combined with coal-tar, ultra-violet irradiation is of value in the treatment of psoriasis. Other dermatoses in which it may have beneficial effects are cutaneous tuberculosis, erythema induratum, alopecia areata, acute vulgaris, pustular folliculitis, indolent ulcers, furunculosis, erysipelas, angioma serpiginosum, pityriasis rosea, hyperkeratotic chronic eczema, telengiectasia and adenoma sebaceum. Skin diseases for which ultra-violet radiation is of little value and may be actually harmful are: atrophy, dermatitis venenata, acute eczema, erythema solare perstans, freckles, various forms of herpes, keratoses, leucoderma, tinea versicolor, urticaria and zeroderma pigmentosum.

Diseases of the Eyes, Ears, Nose and Throat—Local irradiation is of value in the treatment of corneal ulcers, herpetic lesions and blepharitis. In occular tuberculosis local therapy should be combined with general light irradiation.

Ultra-violet irradiation is a valuable remedy for erysipelas of the auricle, eczema of the auricle and pruritus of the external auditory canal. It is a definite aid to slow healing wounds after mastoid operation. It is also of value in tuberculosis of the middle ear. There is little evidence of its value in the treatment of chronic suppurative otitis media

Ultra-violet radiation has been recommended in the prevention and treatment of recurring colds and hay fever. The clinical results have, however, not been promising.

Excellent results have been claimed in the treatment of tuberculous laryngitis by continued general and local ultra-violet irradiation.

Indications for Infra-red Rays.—Infra-red rays are indicated in the following conditions·

1 Acute and chronic nephritis The treatment is of value, combined with medicinal treatment and restriction of protein, salt and fluid.
2 Arthritis
3 Hemiplegia and lateral sclerosis The treatment is of value in relieving spasm and contractures It should be carried in conjunction with massage, manipulation and exercise.
4 Neuritis, myositis, fibrositis, lumbago, local inflammation of soft tissues, sprains and contusions.

Contra-Indications

Ultra-violet therapy is contra-indicated in:

1. Progressive exudative forms of pulmonary tuberculosis, supra-renal tuberculosis and for certain types of tuberculous tracheo-bronchial adenitis in which there may be a febrile reaction, loss of weight and fall in blood pressure following irradiation.

2. Cardiac insufficiency, valvular disease, advanced myocarditis, arteriosclerosis, nephritis, hyper-thyroidism and diabetes mellitus.

   Certain photogenic diseases such as pellagra, lupus erythematosus, hydroa aestivale and xeroderma pigmentosum.

4. Certain other cutaneous diseases such as acute and generalized dermatoses, eczema, freckles, atrophy, keratoses and prematurely senile skin.

5. During menstruation—Some authorities do not consider menstruation as a contra-indication.

II

GENERAL HEAT THERAPY

General heat therapy or fever therapy may be defined as elevation of body temperature by artificial means for therapeutic purposes

Among the first to exploit this form of therapy for alleviation of human disease were Blagden (1775) an English physician and Rozenblum of Odessa (1876) Their work, however, went unheeded and the credit must go to Wagner-Jauregg (1918) for introducing artificial malarial fever in the treatment of nervous syphilis. Plaut used relapsing fever (1920), Solomon rat-bite fever (1926), and Kunde, non-specific protein fever (1927) for therapeutic purposes More recently physical means of inducing fever have been much employed. Among these may be mentioned hot baths, hot packs, electric blankets, radiant heat cabinets, hot humid air cabinets and short-wave diathermy.

1. *Hot Humid Air Cabinets* (*Air-conditioned Cabinets*)—The best example is the kettering hypertherm The cabinet consists of a roomy oblong box on legs of a convenient height and containing a comfortable bed with an air mattress. The head end of the bed projects beyond the box and a sliding door with a rubber groove to fit the patient's neck is lowered in such a manner that, with the exception of the head the patient's entire body is enclosed within the box. The bed is on rollers and can be withdrawn entire when the sliding door at the head end which is raised. There are doors on both sides of the box which move horizontally and give easy access to the patient during treatment. The box is well lighted inside and a window at the head end permits constant observation. The heating arrangement consists of small fan at the foot end which blows air across a small radiant heater The humidity is maintained by a 1,000 to 2,000 watt immersion heater in a pan of water The dry air temperature of these cabinets is usually maintained at between 110 and 130 F and the humidity is maintained at as high a percentage as possible (80 to 95)

2 *Luminous Heat Cabinets*—These are similar to the air conditioned type except that it is heated by four or five 200 watt carbon filament bulbs situated in the top of the cabinet. It has a fan and a humidifying pan with which to circulate and humidify the air.

3. *Short-wave Diathermy*—Heating the patient's body may be accomplished by either the induction coil method (inductothermy) or the condenser plate

method With the induction coil the cable is looped in the shape of a pancake and is placed above or below the patient's body or may be wrapped round it. Insulation of the body is accomplished by means of an insulated cabinet, blankets or a zipper bag

4 *Hydrotherapeutic Methods*—Hot tub baths: Baths are useful in producing low fevers of short duration. Prolonged hot baths are depressing and not without danger. It is not safe to keep patient in hot water for much more than an hour. The technic is to immerse the patient up to the neck in a tub of hot water at a temperature of 105 to 110°F. The patient remains in the tub until his temperature is 103°F to 104°F.

Hot Spray Baths—The nude patient is placed in a cabinet with his head protruding from one end The subject is sprayed with nebulized hot water from a series of jets along the top of the cabinet The temperature of the water is controlled by a thermostat. A momentary shift of the thermostat to cold will cause the nebulized water to become cold for an instant and seems to refresh the patient It, however, causes a slight rise rather than fall in the temperature

5 *Conduction Methods*—Electric Blankets—Electric blankets are satisfactory when fever of not more than 103 to 104°F is required. Their chief disadvantage is that patients are made very uncomfortable by close confinement of the blanket.

Hot-water Bottles and Blankets—The patient is simply wrapped in a number of heavy blankets and is surrounded by hot water bottles

Fever Bags—Special fever bags with zippers are on the market. As with electric blankets these are not recommended for prolonged or high fever therapy.

Physiological Effects

1. The pulse and circulatory rates are increased and both the volume of cardiac output and velocity of blood flow may be increased by as much as 400 per cent There is little or no change in the volume of blood and no change in blood viscosity when the intake of fluids is encouraged during a fever session. Fever therapy not accompanied by sweating does not, of itself, bring about any considerable change in blood volume, but when fever is accompanied by profuse sweating (as is almost invariably the case with long, high fevers) the reduction in plasma volume may be so great as to cause peripheral vascular collapse To prevent this, it may be necessary to administer intravenous normal saline during a fever session

2. There is an initial decrease in the leucocytes during the early part of the session. This is followed by a subsequent increase. The peak occurs usually several hours after cessation of fever and is often as high as 40,000 or more leucocytes per c m.m.

3. Fever therapy accompanied by dehydration and hyperventilation gives rise to marked alkalosis.

4. The serum chlorides are depleted.

5. There is only a slight change if any in the nitrogenous constituents of blood; there is little or no change in the non-nitrogenous constituents of blood such as sugar, calcium, phosphorus and lipids.

6. The B. M. R is increased approximately 7 per cent for each degree of induced fever.

7. The urine is increased in amount.

8. Psychic responses occur during fever therapy and the psychic behaviour of the patient changes with increasing temperature. In some cases incoherence is present and may increase to a stage of distinct delirium similar to that which sometimes occurs in spontaneous fevers.

Technic

Fever therapy particularly if the fever session is to be prolonged and the fever above 103 to 104°F must not be undertaken in the office. It is an institutional treatment and should only be given by those having experience of it. The physician must be within a few seconds call throughout the session.

The selection of the patients must be made with extreme care. Those suffering from hypertension, cardiac decompensation or extreme debility are unsuitable. Cases of nephritis or nephrosis constitute serious risks. Other contra-indications are hepatic disease, arteriosclerosis and large areas of cutaneous anesthesia.

The equipment required is a fever cabinet, electric fans, ice and ice box, intravenous sets, hypodermic syringes, oxygen apparatus, drinking water, drinking glasses and tubes, rectal and oral thermometers, pillow cases, towels, cotton blankets, sheets, etc.

Within wide limits, the duration, the height and the frequency of fever treatments varies with the condition to be treated. For atrophic arthritis fever sessions are of short duration (½-1 hour), the temperature is raised approximately to 101°F and the treatments given daily, if the patient is robust and can tolerate the treatment. In Sydenham's chorea the fever sessions are given daily for 3 hours and the temperature is maintained at 105°F. In syphilis treatments are given twice weekly for 10 to 12 sessions and the temperature is 105°F. In gonorrhea a single fever session of 106.8°F for 10 hours is recommended.

It is never advisable to raise the body temperature above 106.8°F or to prolong fever session beyond 10 hours, else serious damage to the central nervous system may occur.

On the evening before treatment the patient is asked to take a high carbohydrate meal. He is also given a sedative (sedormid, 8 to 12 grains) on the night before treatment. On the morning of treatment 500 c.c. of 5 per cent dextrose in normal saline, are injected intravenously and only liquids (water, tea, coffee) taken orally. Another dose of sedative is taken at 7-30 a.m. Treatment is commenced at 8 a.m.

It is well to prepare the patient psychically for what sensations he may expect during treatment. He should be told that he may expect to be as uncomfortable as he has been during any previous session of spontaneous fever, that everything will be done to make him comfortable (ice to the head, cold drinks, sedatives) and that he will be guarded from danger.

Before the fever session, the nurse or the attendant records the temperature, the pulse, the blood pressure and the weight. The patient's clothes are taken off and he is dressed in terry cloth trousers, a loin cloth, a bath robe and slippers. Chest, arms and feet are rubbed with mineral oil for protection A large pair of flannel boots (of six thicknesses of flannel) is put on to prevent concentration of heat on the toes. The fever cabinet is warmed to 130°F before the patient enters it, and the temperature is maintained until the desired fever is attained. As soon as this happens, the thermostat setting is lowered and the cabinet temperature reduced to 110 to 115°F which is sufficient for maintenance of the patient's body temperature

Throughout the treatment records of temperature (rectal), pulse and respiration are made every 15 minutes when the rectal temperature is below 104°F and every 10 minutes when the rectal temperature is higher

Fluids are forced throughout the fever session. Iced 0 3 per cent saline solution is given at a rate of 550 c.c. per hour to replace fluid and chloride loss. Iced milk, orange juice or aerated water is given if the patient wants it. If fluids by mouth are not well tolerated or the systolic pressure drops to less than 90 mm Hg intravenous saline (500—1000 c c. of 5 per cent dextrose in normal saline) is given. Two electric fans play on the face and add to the patient's comfort

If the rectal temperature rises to 107°F the physician is at once informed The cabinet doors and the windows of the room are opened. Fluids are forced and iced cloths are placed on the face and head. If the temperature still continues to rise the patient's bed (which is on rollers) is removed from the cabinet and tepid, wet cloths are placed on the chest, in the axillas and the groins. After tepid sponging a fan is directed on the nude patient. When the temperature has subsided to the proper level (if the patient's physical condition permits) treatment may be resumed. When fever treatment for requisite number of hours has been given, the patient is removed from the cabinet. Boots, terry trousers, and towel are removed and he is covered with a sheet. The head is elevated on a pillow and an electric fan is directed on his body for comfort while the temperature subsides. When the temperature is nearly normal, he is given a bath and alcohol rub. The pulse, temperature, blood pressure and weight are recorded and he is sent in a wheel chair to a room where he remains for 12 to 24 hours. When the patient is sent to his room after a fever treatment he is not permitted food for 3 or 4 hours. The blood pressure is recorded regularly till it rises to 100 mm. mercury. Patient should be encouraged to take abundance of fluids after a fever session.

The most common untoward reactions observed during fever therapy are headache, restlessness, nausea, vomiting, tetany and muscle cramps.

Occasionally superficial burns occur. One of the most serious complications is circulatory collapse. Another complication of a serious nature, infrequently met with, is heat stroke.

Restlessness requires assurance and sedatives (sedormid, codeine, pantopon, dilaudid and morphine) which may be repeated every 2 or 3 hours. Nausea and vomiting are controlled by 500 to 1000 c.c. of 5 per cent dextrose in normal saline. Tetany may be corrected by intravenous injection of 10 c.c. of 10 per cent calcium gluconate. The skin should be observed frequently for evidence of burns (erythema). Use of oxygen by Boothby-Lovelace-Bulbulian face mask is of value in combating the tendency toward anoxemia and tissue anoxia.

In fever sessions where the temperatures are to be high and prolonged, proper conditioning of the patient, both physically and mentally, chiefly by means of a preliminary, short, low session of fever on the afternoon before the long session, is of immense value

Factors of safety in treatment are—(1) proper conditioning on the evening before treatment; (2) use of an indicating thermometer for constant observation of patient's temperature, (3) high humidity inside the cabinet to prevent dehydration; (4) intravenous therapy before, during or after a session to prevent collapse; (5) installation of proper windows in the cabinet for constant observations; (6) use of tepid sponging (98°F) and fans rather than ice packs during hyperpyrexia, (7) intermittent administration of oxygen by face mask.

Indications.

Artificial fever has been recommended for the treatment of no less than fifty different diseases. For some of these it is useful, for others it is useless and for still others such as arteriosclerosis, subacute bacterial endocarditis, hepatic infections, pyelitis, staphylococcic septicemia and tuberculosis, it may prove positively dangerous. The conditions in which encouraging results have been obtained are:

1 *Chorea*—Hench and his collaborators report that fever therapy is the method of choice in the treatment of chorea The presence of an associated carditis is not a contra-indication, the carditis perhaps benefits by it. Ten to twelve fever sessions of from 2 to 3 hours daily, with bodily temperatures maintained at from 104° to 105°F, form the procedure of choice

2. *Gonorrhea*:—The treatment is of great value in resistant gonorrhea. The most satisfactory results are obtained by using a single fever session of 10 hours duration with body temperature maintained at 106 8°F. The treatment should be given in conjunction with sulfonamides. The best plan is to give sulfathiazol in intensive doses for 18 hours previous to the fever session Fever therapy may also be combined with penicillin therapy in those patients who have resisted cure by adequate doses (2,00,000 to 3,00,000 units) of penicillin alone

In female gonorrhea fever therapy may be combined with local pelvic heating either by Eliot vaginal applicator or by short wave.

3. *Rheumatic Fever*—The results from treatment of rheumatic fever by fever therapy so far reported are encouraging. Simmons stated that of nine

cases of acute rheumatic fever, all with active endocarditis, in six inactivity occurred in an average of twenty fever days after an average of five fever treatments. The procedure followed was several sessions of 4 or 5 hours each with temperature maintoined at 104° to 105°F.

4. *Atrophic Arthritis*—The results of fever therapy in atrophic arthritis are not impressive The treatment (short low sessions of ½ to 1 hour with a temperature of 101°F) may, however, be used as an adjunct to other methods of treatment for chronic infectious arthritis

5 *Syphilis*—Combined with chemotherapy, fever therapy is of distinct value in the treatment of syphilis, especially nervous syphilis. Treatment is given twice weekly and the temperature is maintained at 105°F for 5 hours. Ten to twelve sessions constitute a course. In the opinion of some workers, treatment of neurosyphilis by physical fever gives better results than treatment by malarial fever A definite conclusion in this matter has, however, not yet been reached

6 *Undulant Fever*—Several investigators have reported a rather striking response to fever therapy in patients suffering from undulant fever. A definite clinical improvement with prompt disappearance of symptoms occurred in about 80 per cent of the cases The procedure recommended is to administer a five hour session of fever with temperature maintained between 105° and 106°F From one to three treatments are usually required

Other Conditions—The treatment has been reported to give favourable results in a fairly large number of cases of bronchial asthma. It is not recommended, however, except in cases that fail to respond to other and less drastic measures When employed it should be used in conjunction with other and well known methods of treatment. Other conditions in which favourable results have followed the use of fever therapy are neuritis and mycosis fungoides.

LOCAL HEAT THERAPY

Local applications of heat have been used for therapeutic purposes from immemorial times.

SOURCES—The principal devices for local application of heat are:

1. *Infra-red Radiators*—These are discussed in the section on light therapy.

2 *Bakers*—A baker is an appliance designed for applying heat to the legs, arms or body It consists essentially of a wire frame with a highly polished tin reflector and containing two double holders for 40—60W electric lamps. The council on physical therapy of the American Medical Association gives following specifications for a home made baker:

Specifications—

17" long	Frame 1/16"× 5/8" strap iron
14" wide	Reflector—highly polished tin sheeting
14½" high over all	2 double receptacles for 40—60W Mazda lamps.
Altitude of arc—5"	

The tin is riveted to the strap iron; receptacles connected in multiple heavy lamp cord 6 feet long; plug at the end of this cord.

The above baker is designed for applying heat to the legs or arms. If is to be used for body, supports should be 2" or 3" longer.

3. Short wave diathermy *see* appropriate section

4. Hot baths—*see* section on hydrotherapy

5 Methods employing heated air:

(a) *Hot Air Blowers*—a sleeve-like tube of cloth is fitted over the arm or leg. One end of the sleeve is fastened lightly over the proximal part of the extremity, at the other end is a blower which blows hot air around the part

(b) *Hot Air Chamber*—Hot air chambers are extremely popular in Italy and South America. They consist of asbestos-lined wooden or metal boxes through which circulates extremely hot air derived from an alcohol burner The boxes are made in such a manner that they can be fitted over a hand, a foot, a knee, a leg or an arm.

(c) *Local Applicators heated from within by circulating hot air*—Under this heading may be considered devices such as the rubber vaginal applicator through which circulates hot air, as described by Newman A thin-walled rubber bag is introduced into the vagina and heated air with temperature up to 130°F and pressure of 1 to 1.5 pounds is continuously circulated within it.

6. *Methods employing Chemical Heat*—Pads in which heat is produced hemical means are employed for prolonged local heating Examples of pads are:

(a) *Eye Pad*—It is a rubber pad made to fit the eye and containing chemical crystals which are melted by boiling the pad in water for 10 minutes and gives fairly uniform heat of about 108 F to 114°F for approximately 1 hour The pad can be used by boiling over and over again and gives approximately six-hundred hours of service The components of the chemical mixture used in such pads are. sodium acetate 90 5 per cent, glycerin 3 per cent, sodium sulphate crystals 2 per cent, and sodium sulphate anhydrous 4 5 per cent

(b) *Sinus Pad*—It is similar to the eye pad but is differently shaped. Its weight is about 2 pounds and the weight of the chemical mixture in it is about six ounces.

(c) *Larger Heat Pad for Local Applications to various Regions*—This pad can be used as a substitute for the ordinary hot water bottle. The chemicals (finely divided iron 84 per cent, sodium chloride 6 per cent and manganese dioxide 10 per cent) are in a canvas bag enclosed in flexible rubber material. The weight

of the pad is 18 ounces and its size 10 inches by 12 inches. When it is required for use, 2 drams of water are added and heat is liberated. Treatment with pads is usually given for ½ to 1 hour.

7. *Methods employing Electric Devices*—These include electric pads, electric cuffs and sleeves, electric blankets and the Cooley compress:

(*a*) *Electric Pads*—Pads of light weight containing electric units and operated from the current main are now household utility devices. There is a three-way rheostat which sets the temperature at "low", "medium", or "high". Hench found that the temperature of one such pad was 107.6°F at low, 181.4°F at medium and 244.4°F at high adjustment. These temperatures are in most instances too high for safe local therapy.

(*b*) *Electric Cuffs and Sleeves*—These are based on the same principal as the pad and are employed with satisfactory results for circulatory diseases. A sleeve applied to the proximal or distal portion of one limb will cause reflex dilatation in all limbs. The temperature is controlled by a rheostat and the heat applied for at least 30 minutes.

(*c*) *Electric Blankets*—These have been manufactured for household use but may be used for medical purposes. The current is stepped down by a transformer from the 120 in the house main to 18 volts at the blankets. This removes the danger of severe electric shock.

8. Local heating by means of hot solids or semisolids:

(*a*) *Heated Solids*—Hot salt bags, hot sand bags, and heated bricks have been used from times immemorial. Where more modern means of heating are not available, they are still being used and with benefit.

(*b*) *Hot Mud Packs*—Special virtues are claimed for certain muds used at some continental spas but without any scientific support. Bennet found no difference between the effects of these muds and the ordinary garden mud or Mississipi valley clay. In applying mud packs to-day earth is mixed with water and stirred in a pan over a heater until it reaches proper temperature and consistency. It is then applied directly to the skin over the region to be treated. According to Krusen there seems to be no particular advantage of mud packs over simpler and cleaner methods of local application of heat.

(*c*) *Hot Paraffin Packs*—Ordinary paraffin is melted in the inner pan of a double boiler and allowed to cool until a thin film begins to form on the surface. The paraffin is then painted over region to be heated, about a dozen coats being applied in rapid succession. If the part to be treated is hairy it should be previously oiled and shaved. The hand or the foot can be dropped in the warm wax about six times in quick succession

to form a glove of wax on it The paraffin is removed in 30 to 60 minutes and comes off in one piece. It can be sterilized by bringing the water in the outer pan to a boiling point for 10 minutes and is fit for use again.

(d) *Hot Paraffin Dressings*—When hot paraffin is intended to be applied over joints in acute or subacute arthritis a useful plan consists in the application of alternate layers of hot paraffin and gauze or muslin bandage. The part to be treated is oiled or shaved and a layer of wax applied This is followed by one layer of bandage over which the wax is painted. Alternate layers of wax and bandage are repeated till a warm supporting dressing is obtained The dressing maintains its heat for an hour but may be left *in situ* for 24 hours to give rest and support to the part.

(e) *Hot Paraffin Baths*—Hot paraffin baths are constructed of metal and contain an electrical resisting unit on the floor of the tub. A rheostat maintains the temperature of the liquid paraffin at the proper level (130°F). The extremity to be treated is first dipped slowly into and then removed from the bath The cold air causes the paraffin to solidify The process is repeated several times until the paraffin covering is sufficiently thick to allow the part to be constantly immersed in the paraffin without discomfort At the end of 30 to 45 minutes the treatment is ended and the paraffin peeled off and replaced in the tub

9. Devices Heated by Hot Water.

(a) *Hot Water Bottles*—These are too well known to require description.

(b) *The Elliott Apparatus*—This consists of a small metal box containing a water tank that holds 2 quarts of water; a thermostatically controlled electric heater maintains the water at the desired temperature Two rubber tubes lead from the regulator to the hollow rubber applicator A pressure and suction pump circulates the hot water from the tank, through one tube, into the applicator, and back through the other tube. Various sizes and shapes of rubber applicators are sold with the unit, the most common ones being the vaginal and the rectal applicator Elliott treatment in conjunction with fever therapy in the treatment of gonorrhea, has been mentioned in the section on general heat therapy. The treatment is of value in chronic pelvic inflammation. The rectal Elliott treatment has been recommended for chronic prostatitis

INDICATIONS:

The indications for conductive heat therapy are similar to these described for infra-red therapy—arthritis, neuritis, myositis, fibrositis, lumbago, inflammation of soft tissues, sprains and contusions The hot air chambers have been recommended especially for the treatment of arthritis, the chemical heat pads for inflammatory diseases of the eyes and sinuses, the

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INDICATIONS:

The indications for conductive heat therapy are similar to those scribed for infra-red therapy—arthritis, neuritis, myositis, fibrositis, mbago, inflammation of soft tissues, sprains and contusions The hot air ambers have been recommended especially for the treatment of arthritis, e chemical heat pads for inflammatory diseases of the eyes and sinuses, the

larger chemical pad as a substitute for hot water bottle, the Cooley compress for hot moist dressings for surgical conditions, the electrically heated sleeves or cuffs in the management of peripheral vascular diseases, the hot paraffin packs in the management of arthritis, fibrositis, lumbago, etc., and the Elliott treatment for chronic pelvic inflammations in the female and prostatitis in the male.

III

CRYOTHERAPY

Cryotherapy is the local or systemic application of cold for therapeutic purposes.

Sources and Technique

1 *Local Application of Cold*—Ice bags, cold water baths, cold compresses, cold water coils and exposure to cold air are commonly employed when it is desired to apply cold locally. When applying cold, care should be taken to inspect the underlying skin at frequent intervals. Excessive cold may cause tissue damage just as excessive heat will cause a burn.

2 *General Application of Cold*—The chief devices for lowering systemic temperature are

1 Ice packs.

2. Exposure to cold air (in a refrigeration plant or cold air conditioned room)

3. General cold baths.

4 Cold packs.

Hay and his associates have recently employed general cold therapy in inoperable cases of human carcinoma Although a few favourable results have been reported the treatment is extremely dangerous.

Indications.

Indications for Local Cold Therapy:

1. *Contusions and Sprains* in which trauma has been sufficient to cause danger of extravasation of blood and lymph into the tissues Immediately after the injury and for 24 to 48 hours continuous cold applications are indicated to produce vaso-constriction and to lessen extravasation into the tissues around the site of the injury Tight bandaging is often employed in conjunction with cold applications, the bandaged region being examined from time to time to see whether the circulation has been too greatly impaired

2. *Acute Inflammations and Congestions*—Cold applications are sometimes employed to produce vasoconstriction and to relieve pain.

3. *Acne and Scars caused by Acne*—Karp and his associates have recently recommended local application of intense cold in the treatment of acne. A mixture of dry snow (solidized carbon dioxide) acetone and precipitated sulphur

is applied locally to the face and causes superficial refrigeration with subsequent exfoliation.

4 *Desensitization of patients who are hypersensitive to cold*—This can be accomplished by the simple expedient of having the patient immerse his hand in water at 10°C (50°F) for one or two minutes twice a day for 3 or 4 weeks.

5 *Cold Pressor Test*—The test has been devised by Hines and Brown to pick potential hypertensives from a community. The patient is placed in a recumbent position for 15 minutes A blood pressure cuff is then placed on one arm and a blood pressure reading taken. The opposite hand is now immersed in ice water at 4° to 5° C and blood pressure readings taken at 30 and 60 seconds. The hand is now removed from water and readings taken every 2 minutes until the blood pressure returns to the previous basal level In normal individuals the mean rise in systolic pressure is 8 8 mm Hg and diastolic rise is 7 93 mm. Hg. In essential hypertension, however, the mean systolic rise is 34 5 mm. and diastolic 23.2 mm

INDICATIONS FOR GENERAL COLD THERAPY

1. General effects of mild cold are useful in reducing high temperatures. Applications of mild cold at 77° to 86° F to a large part of body surface are preferable to application of extreme cold to a small region

2. Application of general cold (88°—90° F) as advised by Fay for 3 or 6 days for inoperable carcinomas is an extremely hazardous affair.

IV

ELECTROTHERAPY

Electrotherapy may be defined as treatment of patients by electrical currents. Strictly speaking it does not include treatment by ultra-violet rays, infra-red rays and X-rays.

According to their medical uses currents may be classified as follows:

1 Galvanic constant current;

2 Low voltage varying currents,

3 Static machine currents;

4. High frequency currents;

In this section we shall consider only the first three Diathermy both conventional and short wave is considered separately

GALVANIC CONSTANT CURRENT

The constant current used in medicine is a unidirectional current of low voltage and low milliamperage Its therapeutic value is due to the fact that it possesses a distinct polarity and has the ability to cause a migration of ions

Sources of Constant Current—Constant current may be obtained from:

(*a*) A battery of cells joined in series as in a portable galvano-set.

(b) From a D. C. main by introducing a shunt resistance to reduce its volume as in a galvano-set.

(c) From an A. C. main by use of a rectifier or a thermionic valve as in a portable wall plate, pantostat or a modern clinic table.

INDICATIONS—The constant current is used for:

(1) Introducing a few ions into superficial tissues (ionto-phoresis or medical ionization).

(2) Destruction of tissues (electrolysis or surgical ionization).

(3) Non-specific galvanisation for counter-irritant, osmotic or analgesic effects.

(4) Testing the reaction of degeneration.

IONTOPHORESIS In iontophoresis or medical ionization certain ions are transferred from a pad soaked in the solution of the selected salt to the skin or mucus membrane At present the most frequently employed ions are histamine and mecholyle, zinc and copper. Of the less frequently used ions are silver, mercury and cocaine. All the above ions are introduced from the positive pole. Ions may also be introduced from the negative pole. Examples of such ions are chlorine and iodine.

Histamine and mecholyle ions are useful for peripheral vascular diseases, fibrositis, neuritis, traumatic lesions and arthritis The beneficial results produced are ascribed to hyperemia and it is the opinion of some that the method has no great advantage over simpler methods of producing hyperemia. Zinc iontophoresis has been recommended by several workers in the treatment of hay fever, vasomotor rhinitis and chronic rhinitis. It has also been employed in the treatment of chronic otitis and trachoma. Copper iontophoresis has been stated to be of value in the treatment of all varieties of cervicitis.

ELECTROLYSIS The treatment is of value for removal of superfluous hair in hypertrichosis and for destruction of certain cutaneous lesions such as adenoma sebaceum, dilated capillaries such as occur in rosacea, pigmented hairy moles and nevi.

Technic of Iontophoresis

Histamine Iontophoresis—A piece of gauze is soaked in a 1 in 1000 solution of histamine hydrochloride and applied over the region to be treated. Over the gauze is placed a tin foil or Crooke's metal which is connected by an insulated wire to the positive pole of a galvanic machine. Care should be taken that the bare metal does not come in contact with the bare skin. A large gauze or cloth pad soaked in salt solution is applied to a part of the body remote from the part to be treated. This piece of cloth should have a metal back which is connected to the negative pole by a wire. This pad serves as an *indifferent electrode. The current is turned on slowly and is adjusted in* such a way that the meter indicates that 0.5 milli-amperes of current per square centimeter of the active electrode is flowing. The treatment is usually applied for 3 to 20 minutes. Untoward systemic reactions may occur. These are flushing of the face, generalized perspiration, salivation, dizziness, faintness,

adache and tachycardia Treatment should be stopped at the first sign of severe reaction and atropine 1/100 grain injected hypodermically.

The technic for mecholyle iontophoresis is similar to that described for stamine iontophoresis, the only difference being that the solution of mecholyle sed is stronger (0 2 to 0 5 per cent)

Zinc Iontophoresis

The nasal mucosa is cleansed and a local anesthetic applied. The nasal avity is then packed with ribbon gauze saturated with a 2 per cent solution f zinc sulphate A zinc rod is then inserted into this packing and this is onnected by a wire to the positive pole of the galvanic machine A large indifferent metal backed cloth soaked in salt solution is applied to the back of e neck or as a cuff to the wrist and connected to the negative pole The urrent is increased slowly until 3 or 4 milli-amperes are being administered nd after 3 or 4 minutes it is raised to the comfortable tolerance of the patient usually 10 to 15 milli-amperes). The treatment should last for 10 to 15 minutes.

Zinc iontophoresis for trachoma has been described by Edison. Its echnic is so highly specialised that it will not be described here.

Copper Iontophoresis

Copper electrodes of appropriate size are introduced into the cervix and onnected to the positive pole. An indifferent metal back cloth electrode moistened in saline is applied to the abdomen and connected to the negative pole. The current is turned on slowly and gradually raised to 15 to 25 milliamperes. The treatment lasts for 10 to 15 minutes Three or four such treatments may be required for effecting a cure.

Technic of Epilation

A large pad electrode moistened with saline is connected to the ositive pole of the source and placed under the hand or on some surface of the patient's body. To the negative pole of the source is connected by an insulated wire a fine bulbous tipped steel or platinum needle in an insulated handle. The patient is put in a comfortable position in a well lighted room and the needle inserted into the hair follicle to a depth of approximately ⅛ inch. The current is then turned on slowly and is allowed to flow (usually not more than 1 minute) until a little white bubble appears at the mouth of the follicle. The current is then slowly turned off and the hair easily slides out when tugged lightly with a tweezer. The current volume employed is usually between 0.5 and 1.0 milli-amperes A session should not last more than half an hour. Any remaining hair may be removed at a subsequent session given a week after the previous session. The skin from which the hairs are to be removed and the operator's hands should be previously washed with soap and water and cleansed with 70 per cent alcohol The needle must be sterilized before use. Cipallaro enjoins observance of following rules for good cosmetic results:

"1. "Hairs should not be removed from inflamed areas.

2. A test treatment should be given to ascertain the toleration of the skin of various parts of the body.

3. One should always use the smallest volume of current that will effectively and permanently remove hair. A mild current usually suffices for the upper lip.

4. Contiguous hairs should not be removed at one sitting.

5 The needle should not be left in the follicle longer than is absolutely necessary.

6. The needle must pass through the orifice and it must be in or very close to the hair bulb.

7. The parts to be treated should be cleansed first with soap and water, then with a fat solvent and finally swabbed with alcohol. After the treatment an antiseptic lotion should be used for from 24 to 48 hours."

Technic of Electrolysis for Cutaneous Conditions

(a) *Small Pigmented Hairy Mole*—The hair is first removed as described. The nevus is then treated by criss-cross insertions of a sharp pointed needle. The needle is held parallel to the skin and inserted through the centre of the mole. Several insertions parallel to the first one are then made and when the entire lesion is covered, insertions are made at right angles. During the entire procedure the current continues to flow through the needle, one milli-ampere for larger lesions and 0.5 to 0.75 milli-amperes for smaller ones. The entire lesion is not destroyed at one sitting and as many as three to four sittings may be required at intervals of a week or a fortnight.

Dilated Capillaries

Dilated capillaries occur in rosacea, in spider nevus, following exposure to X-ray and radium and in other conditions. The needle is inserted vertically in the centre of the lesion and is allowed to remain in for approximately a minute.

Risks following treatment by unexperienced technicians are formation of scars and pits, infection and edematous and painful reactions.

(b) *Small Common Warts and Venereal, Flat, Filliform and Digitate Warts*—These may be treated by vertical insertions of the needle or by criss-cross insertions (transfixation) as described for a nevus.

(c) Benign New Growths such as adenoma sebaceum, multiple benign cystic epithelioma and hydrocystoma are often treated successfully by electrolysis. Slightly raised small lesions are treated by verticle insertions and larger ones by transfixation of the needle.

Technic of Non-specific Galvanization

Two metal electrodes on thick, smooth pads of lint wrung out of 1 per cent saline are bandaged to the opposite sides of the part to be treated, care being taken that the electrodes neither come near the skin nor to each other. The current is then very slowly turned on, the technician depending upon the patient's sensations for the amount administered, as this should cause pricking but no real pain. Certain important considerations in giving any continuous current treatment are:—

1. The current must be turned on and off very slowly or the patient will feel a shock

2 The pad must be thick, smooth and without any ridges, as these are apt to cause a local increase in the current and burns.

3. Areas of broken skin must be covered with elastoplast or burns may be caused.

LOW VOLTAGE VARYING CURRENTS

Under this heading are included the following types of currents :

1. The Faradic Current.
2. Interrupted Galvanic and Sinusoidal Currents

The Faradic Current

The Faradic current as used in medicine may be defined as an intermittent, asymmetrical, alternating current obtained from the secondary winding of an induction coil.

Sources—Many small Faradic units are available for medical use The best known of these is the Bristow coil. Recently Morton Smart has introduced two new devices The first of these is arranged to operate from an alternating current main supply and the second is arranged to operate from its own dry cell battery. Other suitable devices as sources of Faradic current are .

1. A small "portable wall plate."
2. Pantostat.
3. Modern clinic table.

All these provide a constant current, an earth-free sinusoidal current and a true Faradic current.

Indications :

There are three chief indications·

1. To stimulate muscles that are poor in tone but have a normal supply.

2. To teach patients to contract individual muscles, *e g*, in poliomyelitis.

3. To produce strong painful stimulation in cases of hysteria, as a means of fortifying or inducing suggestion

4. For testing for the presence of R. D.

Contra-indications :

Faradic stimulation must not be used in the following conditions.

1. In the early stages of acute strains and sprains because muscular contraction may produce further extravasation of blood

2. It should be used with caution in any condition where muscular contractions are contra-indicated, *e g*, in fractures where alignment may be disturbed.

3. In denervated muscles which will not respond to Faradic stimulation

Technic—Metal back electrodes of cloth well moistened are employed The indifferent electrode is large and measures usually about 6 by 8 inches. It is placed in firm contact with a convenient portion of the patient's body. The active electrode is small and is applied to the skin at or near the motor point of the muscle to be stimulated, the motor point being determined from a motor point chart. The current may be applied in two ways. With the first method it is applied at a constant strength. With the second method it is "surged" from zero to the required maximum and back to zero. The first method is more likely to cause painful tetanic contraction and for this reason the rhythmically surged current is more often employed for muscle stimulation. The surging is done by sliding the core in and out of the coil either by hand or mechanically. Manual surging is preferable to mechanical surging and skillful manipulation of the core will cause painless, rhythmic contractions of any group of muscles that possess a normal nerve supply. No point should receive more than ten consecutive contractions. The active electrode should be shifted only when the core is fully withdrawn. The electrode should then be moved a short distance to produce another series of contractions. This is repeated as often as necessary to enable the physician to stimulate all parts of a muscle group. In any series of contractions the desired maximum contraction is reached on the third insertion of the core. A muscle should not be held in a contracted state for more than a second and should be allowed to relax completely between stimuli

Treatments should last for 20 to 45 minutes and should be given daily. Pain and fatigue of muscles must be avoided. Some weak or wasted muscles show signs of fatigue only after 4 or 5 contractions. These signs are muscular spasm, irregular and incomplete contraction and relaxation and especially marked slowing of response.

Reaction of Degeneration—Test for reaction of degeneration is made with the following objects:

1. To determine whether paralysis of a motor nerve is due to a lesion of upper or lower motor neurone

2. To find out whether a lesion of a peripheral nerve has destroyed all or only part of the nerve fibres

3. To get evidence on which an opinion may be hazarded as to prognosis.

The equipment necessary for performance of the test includes:

(1) A Faradic coil

(2) A source of constant current.

(3) An indifferent electrode (3 by 6 inches or larger).

(4) A testing electrode which consists of a small cloth covered metal disc ¾ inch in diameter, on a handle equipped with a finger controlled current interrupter.

(5) Charts showing motor points of various muscles and their nerves.

According to Cumberbatch reaction of degeneration is characterized by the following abnormal responses:

1. No contraction of a muscle when its motor nerve is stimulated by the Faradic or galvanic current.

2. No contraction of the muscle when it is stimulated directly by the Faradic current, but a sluggish contraction when it is stimulated directly by the constant galvanic current.

3 A sluggish contraction of the muscle which is greater when a galvanic stimulus is applied to its extremity than when a galvanic stimulus is applied to its center (longitudinal reaction)

4 In the early stages hyperexcitability of the muscle to galvanic stimulation.

5 In some cases the anodic closure contraction (a c. c), is greater than the kathodic closure contraction (k c. c)

Typical reactions do not occur until ten days after the onset of paralysis.

The reaction may be present when a peripheral nerve is severed by trauma, when there is compression of the nerve by an external lesion, or when there is lesion within the nerve, either at the anterior horn cells as in poliomyelitis or syringomeylia or at its end plate as in peripheral neuritis.

Value of the Test—If there is complete or absolute reaction of degeneration the possibility of recovery is uncertain If, on the other hand, partial reaction of degeneration is present, the prognosis may be more favourable If over a period of time the reaction changes from absolute to partial and then to weak normal, the prognosis may be very favourable If a partial reaction of degeneration changes to a complete reaction, one may suspect that the lesion is progressive and that the prognosis is unfavourable In inflammatory lesions of the peripheral nerves, if there is any response to Faradic stimulation, as a rule, the prognosis will be favourable

Interrupted Galvanic and Sinusoidal Currents

Sources—The interrupted galvanic current may be obtained from the same sources as the un-interrupted or constant galvanic current, the only difference being that some device must be provided for making and breaking the circuit A make and break key, a small button of the push bell type to make and break the circuit or a mechanical interruption a metronome may be employed and answer satisfactorily

The Sinusoidal current is another name for the alternating current and this type of current is now available in all large power net works The current may be obtained from an A. C. main but should be stepped down by a static transformer to remove the risk of shock and to reduce the E. M F. to about 50 volts. Makers of electromedical appliances have put on the market suitable devices from which galvanic, Faradic and earth-free sinusoidal currents may be obtained Such devices have already been referred to and are:

1. Small portable wall plate

2. Pantostat

3. Modern clinic table.

Any one of these may be employed. If the main is D. C. a rotary convertor will also be required.

Indications and Technic—The indications for the use of interrupted galvanic currents are:

1. In testing for the reaction of degeneration.

2. For stimulation of very weak or almost completely paralysed muscles which have failed to respond to the waved or surged form of the galvanic current.

The indications for the use of the sinusoidal current are practically the same as those for Faradic current The sinusoidal current is employed for stimulation of muscles which possess a normal nerve supply. It may be applied in the following ways:

1. A large indifferent, wet cloth metal-back electrode is employed at a convenient place on the patient's body. The small active, padded, moistened metal electrode is held in the operator's hand Each muscle is stimulated separately and at the first sign of fatigue of the muscle, stimulation is stopped Motor point charts are used by the operator as guides for selecting the proper sites for stimulation This is the most common method for employing the sinusoidal current

2 *The Schnee Bath*—It consists of a chair with two large arms on each of which is an insulated receptacle containing a weak saline solution in which the fore-arms and hands may be allowed to rest. Two large insulated receptacles are provided for the legs A metal plate is immersed in each of the four receptacles and each plate is connected by a wire to the source. The current passes through the saline to the patient and produces mild contractions of the extremities The procedure is rarely employed now-a-days.

3. The "full length bath". A single, large bath tub made of porcelain, wood or some other insulating material is used. A metal plate is placed in the bath at each end of the tub Ordinary water (not saline) is used in the tub and the current passed through this water from one plate to another. Sources of either sinusoidal or Faradic current may be connected to the two metal plates Great care must be taken to provide an earth-free source of current and a complete insulation of the tub. This treatment like the Schnee Bath is also seldom employed.

4. *Bergonie Chair*—Both the slow sinusoidal and faradic currents have been used to produce generalized passive bodily exercise. The apparatus is rarely employed now-a-days.

STATIC MACHINE CURRENTS

The current from static machine is a unidirectional current of extremely high voltage (100,000 voltage) and very low amperage (1 milli-ampere or less).

Source—The only machine commonly employed for the production of static electricity is the Holtz influence machine with a whimshurst charger. The apparatus consists of a series of discs rotated by an electric motor. The discs rub against combs made of fine wires and the resulting charge is collected by brushes connected to two movable brass rods on insulated stands. At the ends of these rods are brass knobs which constitute a variable spark gap An insulated glass legged couch is provided for the patient.

Indications—The chief indication for use of static electricity appears to be as a means of suggestion in cases of hysteria The size of the apparatus, the huge noisy, whirling discs, the standing of the patient's hair on end, the long sparks, all have a tremendous psychical effect on the patient

The static wave current and the static sparks have been used for relief of congestion, edema and muscular spasm The treatment has been recommended for such conditions as bursitis, congestion, contractures, contusions, muscular spasm, myositis, neuritis, boggy prostate gland, sprains, synovitis and teno-synovitis Both the static wave and static sparks are said to be of value for chronic inflammation and perineuritic adhesions

The static brush discharge has been recommended for Bell's palsy, bursitis, contusions, ecchymosis, herpes zoster, acute sprain and indolent ulcer. In almost all cases it is suggested that treatment with static electricity should be preceded by applications of heat in some form

Technic—The patient is placed on the couch and the treatment given in many ways of which the following are the ones most commonly employed·

1 *The Morton Wave*—The patient is placed on the couch A soft plate made out of Crooke's metal and of the appropriate size is applied to the patient to be treated and connected to the positive pole of the machine The negative pole of the machine is earthed The machine is run slowly and a positive charge collects in the patient who feels nothing except that his hair stand on end When sufficient voltage has accumulated in the patient, a spark jumps across the air gap between the terminals and the entire circuit is discharged At the instant of discharge the hair suddenly drops and the patient feels a quick, vigorous contraction of the muscles beneath the plate Immediately after this a new charge commences to build up and the process is repeated rapidly, thus producing rhythmic contractions of muscles The treatment lasts 10 to 15 minutes.

2 *Static Sparks*—The Shepherd's crook which consists of a long brass bar with a large hook at one end, is extended from the positive terminal on the front of the machine to the glass-legged couch on which the patient sits The negative terminal is grounded The machine is run to give a spark of the desired length. The patient receives a positive charge The treatment is given by approaching the affected part with a grounded ball electrode, held

by the physician by means of an insulated handle As the brass ball come close to the part, a spark will jump from the patient to the ball and the patient' spark dispelled by a ground wire attached to the ball The sparks may b grounded rapidly and the treatment given for five or more minutes.

3. *Static Effleure*—The positive terminal is grounded. The patien sits on the glass-legged couch and is connected by the Shepherd's crook hel in his hand to the negative pole of the machine The treatment is given by pencil shaped brass-tipped electrode which is grounded by means of a wir Before the operator approaches the part to be treated with the special elec trode, the patient is only receiving a negative charge When the pencil come close to the patient, the charge is grounded in an effleuve to the pencil tip The sensation as the pencil approaches the part is like a blast of cold air strikin the skin As it comes closer to the patient the sensation changes to that o a spray of hot sand The sensations are agreeable and the treatment is ap plied for 10 to 60 minutes. The treatment is supposed to lessen superficia edema and swelling.

Medical Diathermy

Medical diathermy is of two kinds:

1. Conventional Diathermy.
2. Short wave Diathermy.

Conventional or ordinary diathermy may be defined as a therapeuti agent by means of which body tissues are heated by an electrical current o *moderately high frequency which oscillates at a rate of 500,000 to 3,000,00* per second. The voltage (approximately 150) and the amperage (3 milli-ampere for medical purposes and higher for surgical diathermy) is relatively highe than currents of low frequency

Short wave diathermy may be defined as therapeutic heating of the tissue by means of an oscillating current of extremely high frequency (10 million to 100 millions) It is now customary to use the short wave diathermy fo wave lengths between 30 meters and 12 meters. If the wave length is les than 12 meters, the term ultra-short wave diathermy is used.

Sources—No attempt will be made in what follows to describe either th physics or the different types of diathermy machines. A suitable one may b selected from several such, put on the market by reputable manufacturer of electro-medical appliances In America the council for physical therepy o the A M. A. have accepted certain apparatuses and listed it in a booklet.

Conventional Diathermy versus *Short Wave Diathermy*—The concensu of opinions is that there is no great difference between the effects produced by conventional and short wave diathermy, except that the latter apparently produces deeper and more uniform heating, is more easily applied and is less likely to cause burns than conventional diathermy. The beneficial effects of both conventional and short wave diathermy appear to be due solely to heat.

Contra-indications—Diathermy is contra-indicated in the following type of cases

1. Certain acute inflammatory processes, such as acute non-draining cellulitis
2. Acute infectious arthritis
3. Any condition in which there is a tendency to hemorrhage such as a gastric ulcer.
4. Over areas in which heat sensibility has been impaired or lost.
5. Through the abdomen, pelvis or lower part of the back during pregnancy
6. During menstruation or for 36 hours before or after it
7. Over areas where a malignant growth is suspected

Indications—These are

Contusions, Muscle Strains, Sprains and Dislocations—The immediate treatment consists of applications of cold (cold compresses, ice bag) to reduce ecchymosis, swelling, pain, tenderness and limitation of movement After the first 24 hours infra-red radiation and medical diathermy may be applied

Bursitis—For acute bursitis infra-red exposures are given for 30 minutes twice daily and short wave diathermy for 20 minutes once daily As the pain diminishes, careful massage and relaxed motion should be employed, later active exercise is commenced In a few cases in which pain is aggravated by diathermy, it is a good plan to put the patient to bed and apply continuous moist heat For chronic bursitis a fair trial should be given to treatment by rest, infra-red rays, short wave diathermy, massage and exercise, before resort is made to operation

Tenosinovitis—Treatment consists of immobilization of the joint, applications of S W diathermy for 20 minutes once daily followed by radiant heat once or twice daily for 20 minute period

Chronic Arthritis—Applications of local heat as well as systemic applications may prove of great value in the treatment of chronic arthritis In hypertrophic arthritis great care should be taken in applying heat, as it may cause further damage to the already traumatized tissues

Myositis and Fibrositis—Medical diathermy is of value in the treatment of lumbago, pleurodynia, torticollis and rheumatism Massage, exercise and other appropriate treatment should be given in addition.

Fractures—Heat, massage and mobilization are important physical therapeutic measures, and diathermy may be used as one of two methods of applying heat

Neuritis, Radiculitis and Neuralgia respond to treatment by diathermy. In acute radiculitis and neuritis treatment should be commenced with half the patient's tolerance for about ten minutes to see whether there is any aggravation of the symptoms.

Acute and Chronic Sinusitis—Infra-red rays and diathermy are useful adjuncts to other treatment after adequate drainage has been established The most suitable sinuses for treatment with diathermy are the frontal and the maxillary.

Suppurative Processes—Short wave diathermy is of value in the treatment of suppurative lesions such as furuncles and carbuncles. It has no value in the treatment of pulmonary abscess.

Respiratory Diseases—Medical diathermy is a valuable adjunct in the treatment of bronchitis It relieves pain and soreness in the chest, reduces the viscosity of the secretions and makes expectoration easier.

In Pneumonia it relieves the severity of thoracic pain.

Genito Urinary Conditions—Diathermy has been employed locally and for inducing fever in the treatment of both male and female gonorrhea In resistant gonorrhea combined treatment with sulfonamides and fever therapy (which may be induced by short wave diathermy) has proved highly successful. Acute and chronic pelvic inflammation other than gonorrheal are also benefited by treatment with S W diathermy

Technic—Medical diathermy makes use of a number of types of electrodes. The electrodes are rubber covered and are usually placed on the opposite sides of the part to be treated Felt pads for air spacing are kept between the skin and the rubber electrodes The electrodes chiefly used are:

1. *Cuff Electrodes* for treating extremities. The part to be treated is included between two cuffs placed on the extremity.
2. *Pad Electrodes*—Usually two sizes are provided Pad electrodes are of use in treating the trunk (pelvis, abdomen, chest, etc.)
3. *Cable Electrodes*—This is made to surround the part to be treated by wrapping it round the part to be treated. The two terminals of the electrode are plugged in the machine. The cable electrode may also be placed on the part to be treated in the manner of a pan-cake or a U shape. Between the cable electrode and the skin, there is an air spacing of towelling material.
4. *Disc Electrodes*—Disc electrodes are mounted on arms and one disc is placed on each side of the part to be treated. They are very convenient for use on parts such as shoulder, etc.
5. Miscellaneous Electrodes for use are prostatic, sinus, uretheral, etc.

The principle on which the treatment is based is by either creating a condenser field as in cuff, pad or disc electrodes or by induction as in cable electrodes.

Special type of surgical electrodes for dessication, coagulation and cutting are also supplied with most machines Special care is needed in their use.

V

HYDROTHERAPY

Definition—Hydrotherapy is that branch of physical therapy which treats of the application of water in all its forms (ice, water, steam) for therapeutic purposes.

Baruch a great advocate of hydrotherapy said that water may be placed in nearly all the categories of the materia medica.

"1. As a stimulant .. ..a dish of cold water on the face and chest .. ..

2. As sedative...... .. . .the soothing effect of bath of 100° to 102°F. ....

3 As a tonic. .... the tonic par-excellence when properly applied .. ..

4 As a Diuretic—Drinking of small quantities of iced water combined with external applications . . . has increased the urine 50 to 100 per cent ... .

5 As a Diaphoretic—The hot bath is well known even to laymen

6. As an emetic—Large drafts of tepid water . . . . .

7 As a Purgative. The action of an enema is familiar even to the laymen.

8 For the promotion of metabolism

9. As an aseptic,—boiled water; as antiseptic—steam

10 As an Antipyretic—The prolonged bath of 95° to 100°F has established itself as superior to medical agents

11. As a Hypnotic—The wet pack. . . has no superior"

Hydrotherapy may be described under two main heads—Local Hydrotherapy and General Hydrotherapy

LOCAL HYDROTHERAPY

Under this head are included local baths, contrast baths, whirlpool baths, sprays and douches, irrigations and local packs and compresses

Local Baths—Among these may be mentioned the half bath, the sitz bath, the hand or arm bath and the foot bath

Half Baths—In the half bath, only the pelvis, the hips and the lower extremities are immersed in water The tub is filled with water to the proper level. For a cold half bath the temperature should be between 70° to 85°F, for a hot half bath between 103°F to 110° The effect of the cold half bath is similar to that produced by cold ablutions or the drip-sheet bath, that of the hot half

bath is to relieve pain and to increase the peripheral circulation of the lower extremities

Sitz Baths—The patient sits in water with the hips, genitals and pelvis immersed. The water should reach the level of the umbilicus and the lower extremities are kept outside the tub (The cold sitz bath is applied at a temperature of 50° to 70°F, and its duration is from 2 to 10 minutes The immersed parts are rubbed briskly. The un-immersed parts (legs and upper parts of the body) are covered by blankets It has been recommended in the treatment of congestion and stasis of gastro-intestinal organs, amenorrhea, prostatorrhea, spermatorrhea, atony of the bladder, atonic constipation and impotence Cold sitz baths should not be given if renal inflammations or hyper-irritability of the genital organs is present.

The hot sitz bath is given at temperatures between 98° and 110°F and its duration varies from 5 to 10 minutes It has been recommended for treatment of dysmenorrhea, amenorrhea, prostatitis, ureteral colic, pelvic inflammation and gluteal fibrositis The contra-indications are pregnancy and menstrual periods

Hand and Arm Baths—An ordinary large dish pan or a specially shaped arm bath is filled with warm or hot water at a temperature between 98° to 110°F The duration of the bath is usually half an hour It is recommended in the treatment of cellulitis, burns, sprains, contusions, infected wounds, arthritis and circulatory diseases

Foot Baths—Foot baths may be given hot or cold A container large enough to permit immersion of the feet and lower part of the leg is filled with water. For a cold foot bath the temperature of the water should be between 50° to 70°F and the duration of the treatment from 10 seconds to 10 minutes Cold foot baths have been recommended for bromidrosis and persistent cold feet For hot water baths the temperature of the water should be between 100° and 110°F. The treatment is given usually for 10 to 30 minutes The chief uses are for treating sprains or contusions of the ankle or foot, general chills, neuralgia and menstrual cramps. Occasionally warm foot baths may be employed for burns and cutaneous diseases Hot mustard foot baths have been recommended in the treatment of coryza. Four ounces of mustard powder are added to the foot bath at a temperature of 101° to 106°F and the feet immersed for 10 to 20 minutes.

Contrast Baths—Contrast baths are of great value in the treatment of hyper-trophic arthritis, atrophic arthritis, fractures of hands or feet and peripheral vascular diseases Two containers are employed, one containing hot water at 100° to 110°F and the other cold water at 50° to 65°F. The patient alternately immerses the part to be treated in hot or cold water several times, starting and ending in hot water. The treatment recommended is 4 minutes hot, one minute cold, alternations and the series should be from 7 to 9 alternations (4-1-4-1-4-1-4 or 4-1-4-1-4-1-4-1-4).

Whirlpool Baths—The specifications for a home made whirlpool bath are given by the council of physical therapy of A. M. A. and a local plumber may

be asked to assemble one, after perusal of the illustration and specifications (Hand-book of Physical Therapy A M A) Alternatively a manufactured bath may be purchased Either an arm or a leg may be treated. The temperature of the water in the bath should be between 105° and 110°F and the duration of treatment half an hour The whirlpool bath is indicated in the treatment of painful stumps, sprains, dislocations, peripheral vascular diseases, arthritis, infected wounds of the extremities and in the treatment of fractures at the time of removal of a limb from a cast or splint and as preparatory for subsequent massage and exercise Both contrast and whirlpool baths are contra-indicated in conditions in which either hot or cold foot baths are contra-indicated In the treatment of peripheral vascular diseases, the temperature of hot water should not exceed 105°F.

Sprays and Douches—Among the sprays and douches that can be applied to the local regions of the body are the rose spray or douche, the fan douche and the filiform douche (The rose spray consists of a shower rosette on the end of a rubber hose and is employed to spray a local region of the body with hot or cold water It may also be used for administration of contrast sprays to regions of the body (for example, shoulder) that cannot easily be immersed in contrast bath tubs The temperature of the hot and cold waters and the duration of treatments are similar to that mentioned for contrast baths

The jet douche is a stream of water projected from a hose with a nozzle. The volume of the jet can be varied by use of nozzles of different sizes (The fan douche is produced by placing a finger over the nozzle in jet douche in such a manner that the stream of water is spread out in the shape of a fan) Alternatively a nozzle tip with a slotted opening that will shape the stream of water into a fan shape, may be employed

A filiform douche is an extremely small jet of water applied with great force to the skin.

The rose-spray is indicated in the treatment of fibrositis, the jet douche in the treatment of atrophic arthritis and the filiform douche as a counter-irritant

Irrigations—Irrigations are employed to wash out the body cavities The more commonly employed irrigations are the colonic, the vaginal and the conjunctival; those employed less commonly are of the ear, nose and throat, the stomach and the bladder

Colonic Irrigation—The equipment required consists of an ordinary treatment table or bed, a plain glass irrigation jar on a stand, a rectal tube, and Y tube with two clamps and a large closed vessel to receive the return flow.

If the patient has not defecated, the bowels are emptied by a plain water enema and the defecation reflexes allowed to subside The rectal tube is lubricated and inserted from 5 to 6 inches The reservoir is kept 2 ft above the level of the rectum For first gallon the patient lies on the left side with the knees drawn up, after that he lies on his back. The total quantity of fluid required for an irrigation is from 6 to 10 gallons and the procedure takes nearly

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an hour. Colonic irrigations are said to be of value in the treatment of arthritis

Vaginal Irrigation—The equipment required consists of an irrigation can, rubber tubing and a special vaginal nozzle The irrigator is kept at a height of 3 feet above the level of the vagina and the temperature of the fluid should be between 100° and 125 F Vaginal douches are indicated for their cleansing (water), astringent (aluminum acetate, a teaspoon to 2 quarts of water), antiseptic (1-2000 biniodide of mercury or a teaspoon of dettol to the quart of water), or thermic action

LOCAL PACKS OR COMPRESSES.

Head Compress—It is a cold compress applied to the head during fevers with the object of reducing temperature and alleviating febrile headaches Its use is too well known to need description.

Throat Compress—Two strips of linen 3 inches wide and long enough to reach under the chin from one ear to the other are wrung out of water at 60°F, placed upon a piece of flannel and applied to the throat The flannel strip is drawn tightly over the head and secured by safety pins The compress is changed when it becomes warm and dry It is indicated in tonsillitis and laryngitis

Chest Compress—A large piece of linen is procured and cut in such a manner that it fits the upper part of the back and the chest from the clavicles to the umbilicus Neck and arm spaces are allowed and the upper edges of the compress project beyond the shoulders behind and can be brought over and pinned to the front part of the compress A piece of flannel of the same shape but an inch wider all round and one inch longer is also cut The linen compress is immersed in water at 60°F and wrung It is spread on the piece of flannel The patient is placed on the compress with his skin next to linen and the edges of the compress brought together and pinned The flannel is then brought over the linen and pinned also. A second compress is prepared in a similar manner and renewed every hour Chest compresses are of value in bronchitis and pneumonia

Trunk Compress or Half-pack—For an adult a folded sheet is required and for a child a turkish towel will do It is wrung out of water at 60° to 70°F, wrapped round the body from axilla to pubis, and covered with a piece of dry flannel which is secured by pins It is changed every 2 hours for temperatures above 101°F and every hour for temperatures above 105°F. According to Fantus it is the most useful form of antipyretic pack It is mild enough to be used for children and collapsed patients and can be used for very high temperatures during intervals between more radical procedures.

Cold Compress—A linen cloth or towel is immersed in water at a temperature of 60°F and partially wrung out. It is then applied to the region of the body to be treated. It is kept cool by changing it frequently, by covering it with an ice bag or by placing over it an aluminum coil of light weight through which cold water at a temperature of 55° to 60°F is circulated. Indications for local cold therapy have been discussed under cryotherapy.

Hot Compress—A folded linen cloth or towel is immersed in hot water at a temperature of 107° to 115°F. It is partially wrung out and applied to the region to be treated. It is then covered with a covering of oiled silk or cellophane to prevent evaporation and drying of the compress. To keep it hot it must be either frequently changed or kept hot by use of a hot water bottle, a circulating water coil with temperature of circulating water at 107° to 115°F or a luminous or infra-red lamp. Hot compresses are indicated for relief of pain and to promote absorption of inflammatory exudates

GENERAL HYDROTHERAPY

Under this heading will be described the following procedures.—

1. Full baths
2. Brine baths
3. Effervescent baths
4. Oxygen baths.
5. Bland baths.
6. The Hubbard tank.
7. Pools
8. Sprays, douches, ablutions and affusions
9. Packs

1 *Full Baths*—Full baths may be administered as cold full baths, tepid full baths, neutral full baths, hot full baths or continuous full baths

Cold Full Baths—An ordinary bath tub is filled with water at a temperature between 50° and 80°F. The patient enters or is immersed in the bath quickly up to the chin and the entire surface of the body is briskly rubbed The duration of the bath is from ten seconds to three minutes The patient should be removed from the bath before he becomes chilled He is then rubbed briskly with a coarse towel and dressed Debilitated patients should be wrapped quickly in woollen blankets The bath is recommended for stimulation of general metabolism, treatment of debility due to sedentary living, atonic constipation and obesity. It has been employed as an antipyretic measure and was recommended by Brand for treatment of enteric fevers It is contraindicated in people sensitive to cold, vaso-spastic disturbances and urticaria.

Tepid Full Baths—An ordinary bath tub is all that is required. The temperature of the water is between 80° and 92°F and the duration of the bath between 10 and 20 minutes The effect is soothing and antipyretic It is contraindicated in advanced cardiac disease, arteriosclerosis or extremes of ages.

Neutral Full Bath—The patient is immersed in water up to the neck at a temperature of 92° to 97°F The duration of the bath is from 30 to 60 minutes. The effect is slightly sedative. Neutral baths are used to allay nervous excitability or to treat insomnia.

Hot Full Baths—An ordinary bath tub or a Hubbard tank will be required. The temperature of the water should be between 98° to 108°F according to

requirements. The duration of the bath is usually between twenty and thirty minutes but may vary between 20 to 60 minutes. Prolonged hot baths should be given with caution, else hyper-pyrexia and collapse may occur. The warm full bath is indicated in the treatment of convulsions, the cerebral manifestations of certain acute febrile disorders, acute sciatica, dysmenorrhea, amenorrhea and insomnia. The hot full bath is extremely useful in the acute exacerbations of chronic infectious arthritis It has also proved of value in the treatment of fibrositis, chronic myositis and certain forms of neuritis Its use has been suggested for the relief of muscular spasm, abdominal colic, bronchitis, gout and nephritis in which hypertension is not marked Finally in cases of suspected acute abdominal disease in which marked spasm prevents satisfactory examination, relaxation often can be obtained and a more satisfactory examination made when the patient is placed in a hot bath. Hot baths are contra-indicated in the presence of marked hypertension, artiosclerosis, advanced debility, functional neuroses or in conditions with hemorrhagic tendency.

Continuous Full Baths—Continuous full baths are employed in institutions for treatment of mental cases to control acute manias A special large institutional tub equipped with attachments for holding a canvas hammock is used. The temperature of the water should be between 94°F and 98°F The head rests on a rubber pillow and the body is greased to prevent or limit the maceration of the skin which may follow prolonged immersion. The first immersion should last for approximately an hour It is gradually increased until the patient is immersed for 2 to 3 hours, two or three times a day Maniac patients may be left in the bath for 6 to 14 hours continuously each day, although they are usually removed at night. Occasionally in extreme cases, patients are kept in the bath for two or three weeks without removal. Apart from control of acute manias, continuous baths have been recommended for extensive burns, indolent ulcers, gangrene, suppurating wounds, certain diseases of the skin, chronic inflammations of muscles and joints and hyperesthesia. They are contra-indicated in advanced cardiac diseases, hypotension, subnormal body temperature and asthenia

Brine Baths—A teak wood tub is used as brine has a corrosive effect on porcelain and metal From 5 to 30 pounds of sodium chloride are added to 40 gallons of water. Wright suggests the use of the following formula for artificial sea water. 7 lbs of sodium chloride, 1 lb. of magnesium chloride and ½ lb. of magnesium sulphate for 30 gallons of water. The usual temperature is between 94°F and 98°F but temperatures between 85°F and 105°F may be employed The duration of the bath is between 10 and 45 minutes Brine baths have been used chiefly for osteomyelitis, fractures, dislocations, fibrositis, myositis and arthritis They have also been recommended for the management of gout, chronic sciatica and obesity They are contra-indicated in the presence of inflammatory diseases of the skin, hypertension, arteriosclerosis and cardiac disease.

Effervescent Baths—The carbon dioxide or the "Bad Nauheim" bath is the one best known. A special carbon dioxide mixing apparatus is employed and the water is impregnated with carbon dioxide. A tub is fitted with water at 86° to 94° F and 4 to 8 pounds of sodium chloride are dissolved in the water.

The highly carbonated water from the mixing apparatus is then allowed to flow into the tub through a connecting hose. An alternative method of preparing a carbon dioxide bath but not as good as the first one, depends upon the use of chemicals. The tub is filled with salt water at 86° to 91° F as before and 8 ounces of sodium bicarbonate are added and stirred in Six to eight specially prepared tablets of acid sodium sulphate are then placed evenly on a sheet of rubber along the floor of the tub A chemical action takes place and large quantities of gas are liberated Yet, third but the least satisfactory method is to connect a tank of carbon dioxide gas by rubber hose to a frame consisting of bamboos or rattan reeds This is placed at the bottom of the tank and the gas allowed to flow into the water The patient is immersed in the bath as soon as it is prepared and the bath is covered with a sheet to prevent his inhaling carbon dioxide Once in the bath, he is asked not to move and disturb the gas bubbles on the skin. The first bath is given at a temperature of 91° F and its duration is eight minutes After bath the skin is gently dried and the patient permitted to rest for an hour Treatments are repeated on alternate days, the duration of the treatment during subsequent sessions is slowly raised to 10 or 15 minutes and temperature reduced gradually from 91° to 86° F A course of treatment consists of from 18 to 24 baths A second course may be given, if necessary, after an interval of 6 to 8 weeks Effervescent baths are indicated in the treatment of valvular heart disease (mitral insufficiency, mitral stenosis, aortic stenosis), myocardial degeneration, arteriosclerosis and hypertension They have also been employed for neuresthenia, insomnia and nervous excitement They should not be given to patients with marked congestive failure, febrile endocarditis, advanced syphilitic heart disease or severe nocturnal dyspnea

Oxygen Baths—A large oxygen cylinder is connected by a rubber hose to several bamboo or rattan reeds on a frame This frame is placed on the floor of a tub which is filled with water at 91° to 95° F The gas is allowed to flow in the water An alternative method consists in dissolving a peroxide in water and adding a catalyzer Special chemicals are available on the market for this purpose The duration of the bath is from 10 to 25 minutes Oxygen baths have been recommended in the treatment of hypertension, cardiac neuroses and advanced cardiac disease when Nauheim baths cannot be tolerated. Nylin also recommends them for nervous irritability and insomnia

Bland Baths—A decoction of 5 lbs of starch in 1 gallon of water or 3 lbs of wheat bran in 1 gallon of water, is added to the water in the ordinary bath The temperature should be between 95° F and 98° F and the duration of the bath between 20 and 30 minutes The baths are of value in generalized pruritus and dermatitis

The Hubbard Tank— It is a special kind of bath tub, shaped like an old fashioned key hole and employed for under-water exercises It provides a moderately good substitute for an exercise pool, when only a small space is available The temperature of the water in the tank should be between 90° F and 100° F and the duration of the bath between 20 and 30 minutes In lifting the patients into the bath it is sometimes necessary to use a crane The stretcher

or the sling on which the patient is supported is lowered into the bath by the overhead crane, the patient left lying in the tub and the stretcher or the sling slides from beneath him The back rest or the head support is so adjusted that the patient lies comfortably in the tub and can move his arms and legs freely The technician wears a rubber apron and stands at the side of the tank to assist the patient with various exercises At the end of the treatment the sling is replaced under the patient and he is moved to a massage table The skin is dried and the body covered with warm wraps He is then sent back to his bed to rest.

Therapeutic Pools—According to Lowman a pool should be 20 to 21 feet long and 12 to 15 feet wide. At the deep end it should be 4 feet 6 inches deep and the floor should slope gradually upward to a depth of 2 feet 6 inches at the shallow end If space is limited a 10 by 12 feet pool may be built Water inlets and outlets should be so arranged as to allow good circulation of water Hand rails should be provided all round the edge of the pool The floor should be of nonskid tiles or slightly roughened cement The lighting should be from the side or indirect to avoid glare and shimmer on the surface of the water. Lowman recommends that the temperature of the water should be 90° F for hypotonic cases and 100° F for hypertonic or spastic cases. For arthritis and joint conditions a temperature of 100° to 101° F is recommended.

The room in which the pool is constructed should be properly ventilated to cope with excessive heat and humidity At the same time the air in the room should be kept sufficiently warm to prevent chilling Therapeutic pools are made use of to administer under-water exercises.

The patient and the manipulator both descend into the pool. When the patient is severely crippled he is lowered in on a "jantry" A douche pipe connected to a tank of water at temperature slightly higher than that of the pool is used at the beginning for under-water massage It has a useful preparatory effect in relaxing muscle spasm After this the patient is instructed in exercises, walking re-education, or his joints are put through their range of passive, assisted or resisted movements according to requirements.

According to Lowman indications for hydrogymnastics are: poliomyelitis acute and chronic, spastic paralysis, post-operative follow-up on joint plastic operations and tendon transplantations; beginning follow-up after correction of congenital dislocations of the hip; beginning follow-up exercises in case of back-ache, chronic arthritis, muscular inco-ordination in certain neurologic conditions "which need to be encouraged and worked with if for no other reason than to improve the general metabolism and boost the morale."

Sprays—The commonly used sprays are the rain spray or shower and the needle spray. The rain douche is given by using an ordinary rosette or rose about 8″ in diameter and 8 feet high from the floor. The needle shower consists of a cage of pipe with a series of rosettes so arranged that forceful, fine streams of water converge from all sides on the patient's body from shoulders to lower legs.

Douches—Scotch Douche—The Scotch douche is given by two hose pipes, one carrying hot water and the other cold water and held at a distance of 10 to 12 feet from the patient The temperature of the hot water douche is 100° to 110° F and of the cold water douche 60° to 80° F and the pressures 10 to 20 pounds and 15 to 25 pounds respectively The patient stands with his back to the operator and the hot water douche is moved upward from the base of the neck downward, along the back of the upper extremities From the lower part of the back of the trunk the hose is moved down towards the back of the lower extremities and then up again to the lower part of the trunk and on both sides of the spine to the base of the neck After the circuit has been completed the cold water douche is directed over the entire back of the patient's body The rapid alternation of the hot and cold douches may be repeated several times Then the patient turns and the procedure is repeated over the front of the patient's body. It is customary to end the treatment session with an application of cold douche to the back surface of the body The total duration varies between 3 and 10 minutes The effect is one of marked stimulation The procedure is of value as a refresher after application of prolonged local or general heating in cases of arthritis, fibrositis, myositis, chronic alcoholism and similar diseases. It has also been recommended for debility due to sedentary living, for chronic sciatica and lumbago

Ablutions—Water is applied in conjunction with friction as in cleansing of the body The patient is placed on a rubber sheet and his body covered with a blanket or sheet according to need Two pans with water at 50° to 65° F for face and hands, and 70° to 80° F for the rest of body are kept on a bed side table The face and the hands are bathed first and then chest, the arms down to the elbows, the back, the abdomen and the lower extremities down to the knees in that order Each part is dried before the next is exposed and treated The duration of the treatment is 10 to 30 minutes At the end of the treatment the patient is wrapped in a dry sheet and covered with whatever blankets are necessary Ablutions are recommended to reduce temperature in hyperpyrexia and in the treatment of hypochromic anemia and functional nervous disorders

Affusions—In this procedure water is poured over the patient from a bucket or a pail at a height of 2 feet from the patient who may be standing or sitting or in a recumbent position in a suitably prepared bed (with rubber sheet which drains into a bucket at the foot of the bed) The temperature of the water is usually from 60° to 80° F although occasionally hot water (105° to 115° F) may be employed The duration of the treatment is between 3 and 5 minutes The effect is stimulating and the procedure has been recommended for neuritis, arthritis and functional nervous diseases.

Packs—Full Wet Pack: A rubber sheet is placed on the bed and over it is spread a blanket A sheet is wrung out of cold water (60° to 70° F) and quickly applied to the patient's bare skin. The blanket is then smoothly wrapped over the patient and folded closely around the neck and under the feet One or two additional blankets are then tucked well all round The first effect of the pack is a constriction of the peripheral vessels and an increase in the respiratory rate. Within one to five minutes there is a reaction, the patient begins

to feel warm and begins to perspire rather profusely. The effect of the bath is markedly sedative.

The full wet pack has been used with advantage in the home management of arthritis, fibrositis and myositis It has been recommended in the control of delirium and for psychoses, psychoneuroses, hyperexcitability and insomnia It has also been employed in the treatment of nephritis. It must not be used when there is any severe circulatory disturbance, cardiac disease, extreme exhaustion or when it is clear that a "reaction" may not occur.

VI

MASSAGE

Definition—Massage may be defined as the systemic and scientific manipulation of soft tissues in the treatment of disease or injury.

Physiological Effects—The physiological effects of massage are manifested on the skin, muscle, blood, circulatory and the nervous system.

Skin—Massage acts directly on the surface of the skin to remove detritus and excessive secretions It also causes a local rise of temperature.

Adipose Tissue—Even vigorous massage will not remove deposits of fat in various regions of the body

Muscle—*Effleurage and petrissage will improve the blood supply* to the muscle and would tend to remove the excess of lactic acid without producing more of it. Massage also helps stretching intramuscular connective tissue It will not increase muscular strength

Blood—Massage causes an increase in the hæmoglobin percentage and the number of circulating red blood cells.

Circulation—Massage can produce a mechanical effect on the circulation of blood and lymph by assisting, by means of centripetal stroking the return of venous blood or lymph to the heart or by causing reflex contraction of the unstriped muscle fibres in the walls of the vessels, thereby assisting to maintain or restore the tone of the fibres

Nervous System—Skilfully applied massage may produce either a sedative or a stimulative effect

Method and Technique

Massage may be applied manually or rarely mechanically.

Manual Massage:—It is customary to describe manual massage under the following 5 heads: (*a*) effleurage or stroking, (*b*) petrissage or kneading, (*c*) friction, (*d*) tapotment or percussion and (*e*) vibration.

(*a*) *Effleurage*—Effleurage or stroking is the most frequently used form of massage It consists of long stroking movements and is accomplished by passing the hand slowly, gently and systematically over a portion of the patient's

skin. Effleurage may be superficial in which case the effect is obtained through a reflex mechanism, or deep in which instance there is actual mechanical emptying of the veins and lymphatics Superficial stroking to be most effective must be unidirectional as well as slow, rhythmic and gentle The number of strokes per minute is approximately fifteen

In deep effleurage the stroking is always centripetal and when the part massaged is an extremity, the proximal segment is massaged earlier than the distal

(*b*) *Petrissage*—The tissues (a portion of a muscle or a group of muscles) are picked up or lifted from the bones and rolled, compressed or wrung The hand is then moved along a hand-breadth and the procedure repeated in a rhythmic style until the entire region has been covered One or both hands may be used If the muscles cannot be picked up as in the case of the back they are rolled or pressed Petrissage is said to have a marked stimulating effect on the muscles and on the circulation in the deeper veins and lymphatics

(*c*) *Friction*—The hand or fingers of the technician remain firmly applied to one spot on the skin of the patient The skin is then made to move in small circles over the underlying parts The pressure should be moderate and the motions rhythmic No lubricant should be employed as otherwise the fingers will slide over the skin This type of massage is particularly useful for loosening superficial scars or adhesions to free adherent skin and to assist in the absorption of local effusions

(*d*) *Tapotment or percussion* includes hacking, clapping or cupping, tapping, slapping and beating The most frequently used form is hacking and is applied with both wrists relaxed The hands are held in such a manner that the part can be struck alternately with the ulnar surfaces of the relaxed hands The little finger strikes first, then the other three come in contact with the part in rapid succession In clapping or cupping, the cupped palmer surfaces strike the surface alternately in rapid succession In slapping the hands are not cupped, they are entirely flattened and the palmer surfaces strike the surface alternately but more firmly than is the case with clapping In tapping only the tips of fingers are used Fingers of one hand and then the other strike the skin alternately. In beating the wrists are fully relaxed and the part is struck with the relaxed, half clenched fist

Percussion is said to cause muscle stimulation and improvement in muscle tone

(*e*) *Vibration*—Vibration is the least frequently used form of massage and the one most difficult to apply It is also extremely tiring for the technician A continuous trembling movement is imparted by the muscles of the operator's shoulder and forearm through the tips of his fingers or his whole hand to the part to be treated It has been applied chiefly along the spine for its general tonic effect and occasionally over the head for migraine

No matter what the form of massage certain general rules should be kept in mind In the words of McMillan these are

1. "See that the patient is in as comfortable a position as possible, and that the operator is in the best position to do the work

2. Always support the part that is being massaged.

3. The operator's muscles must be relaxed as well as those of the patient.

4. The clothing of the operator should allow of perfect freedom and ease of movement; no sleeve should be worn below the elbow.

5. All the procedures should be started moderately, increasing both in force and frequency and should end gradually as started.

6. Petrissage should be performed with the whole palmer surface of the hand and not with the finger tips, except where finger and thumb petrissage is required to pick up individual muscles, or smaller muscle groups."

Mechanical Massage—Rollers, balls and many other devices have been put on the market for mechanical application of massage but with the exception of the mechanical vibrator which is fastened to the back of the operator's hand and is of value in vibration massage, all are perfectly useless.

Indications—The number of conditions for which massage has been recommended and used is legion

Diseases of Blood and Circulatory System—Anemia: General and abdominal massage is of definite value in cases of secondary anemia. There is a rise both in the number of R B C and the hemoglobin percentage. It is of no value in primary anemia

Cardiac Decompensation—In heart failure with edema it is of value in conjunction with rest, restriction of fluids and salt, and medication

In conjunction with judicious application of heat it is a useful adjunct in the management of acroparesthesia, intermittent claudication and Raynaud's disease It has been employed with advantage in the treatment of chilblains In the treatment of this disorder at first the proximal section of the limb is massaged and then the distal At first, light superficial stroking movements are used, then deep stroking and kneading are applied.

Diseases of the Digestive System—Massage has been recommended in the treatment of mucous colitis Application of heat should be followed by light massage of the back Its value in constipation is at best doubtful Menell has recommended the use of abdominal massage following abdominal operations Massage of the abdomen and general massage has also been recommended in atonic dyspepsia, gastric neuroses, diseases of the liver and visceroptosis.

Metabolic Disorders—Diabetes The fact that massage may be invaluable in diabetes is not sufficiently known General and especially abdominal massage with the idea of assisting the portal circulation is recommended. Massage of the extremities may aid in the prevention of diabetic gangrene or assist in its control if it has already developed. The entire extremity should be stroked and kneaded, working distally. The procedure must be extremely gentle over discoloured areas and no traumatisation of devitalized tissues should occur.

Respiratory Diseases—In conjunction with postural drainage chest clapping, back hacking and vibrations have been recommended in the treatment of bronchiectasis General massage combined with deep stroking and kneading of the thoracic muscles and percussion of the upper part of the back over the apices of the lung, has been recommended in the treatment of chronic bronchitis and emphysema

Nervous Diseases—Massage has been employed in the treatment of hysteria, neuresthenia, the diseases of the C. N. S (anterior poliomyelitis, Parkinson's disease, P M A spastic paralysis, etc), and the peripheral nerves In poliomyelitis, although massage will not aid in restoration of paralyzed muscles, it will delay muscular atrophy by improving nutrition. It should be preceded by applications of heat and followed by active assistive or active exercise The massage should not be commenced until after recovery from the acute and painful stage of the disease Only light type of massage should be applied and for a short duration, heavy massage is not tolerated

In spastic paralysis, moderately firm superficial stroking, which is very slow and rhythmic may assist in promoting relaxation before exercises are attempted

Obesity—Massage as has been pointed out earlier is of no use for destroying adipose tissue General massage, however, in conjunction with low caloric diet, applications of heat and exercise may prove of value

Arthritis—Except in the case of bony ankylosis or pathologic contraindications, massage, exercise and continuous traction or stretching by splints have an important place in the treatment of stiff joints The massage in these patients is usually preceded by heat and followed by exercise. Deep stroking movements are followed by deep kneading of the muscles above and below the joint. Friction massage is applied over the joint

Fibrositis—In fibrositis there is formation of new fibrous tissue which is swollen, painful and tender and can be removed by skilled massage Fibrositis according to Hench may be classified as panniculitis, bursal or tenosynovial fibrositis, fascial and intramuscular fibrositis, periarticular fibrositis, perineural fibrositis It may manifest itself as lumbago, pleurodynia, torticollis or rheumatic headache

Treatment consists in the application of heat followed by heavy massage over a period of 3 or 4 weeks Deep thumbing movements over the painful areas are followed by deep kneading and pressure with a view to break up the deposits

Gout—Massage must never be used for acute gout For chronic gout local massage similar to atrophic arthritis is recommended

Surgical Conditions—Massage properly applied is of value in the treatment of sprains, dislocations, fractures and amputation stumps.

Sprains—The treatment is commenced with superficial stroking with the entire extremity in a relaxed and elevated position After two or three days heat and deeper stroking and kneading massage canus ually be started.

contributory causes are improper clothing, faulty development of the body, poor nutrition, rickets and various other diseases It is not sufficiently realized that a poor posture not only often gives rise to poor health but is associated in the mind of the observer with poor morale, dejection and lack of self-respect. A good posture is, on the other hand, associated with an abundance of vitality and an appearance of self-respect.

For persons with faulty posture the following words of command from Krusen's Physical Medicine are recommended:

"1 Walk with the feet pointed straight ahead and throw the weight forward on the balls of the feet.

2 Roll the hips under.

3 Raise the chest up.

4 Try to stretch the back part of the top of the head toward the ceiling

5 Walk, stand and sit as tall as possible."

The following directions for correct standing, sitting, walking or correcting the posture are from Krusen and Wiechec.

Correct standing

1 Head up, chin in, stretch top of head toward ceiling.

2 Chest up, breast bone the part of the body farthest forward.

3 Lower abdomen in and up.

4 Hips rolled under Hold abdominal and buttock muscles firm

5 Feet parallel with weight evenly distributed.

Correct sitting:

1. Chin in, ribs up, back flat, pelvis or hips nearly on a level.

2 Body held as tall as possible

This overcomes the common fault of bending at the waist rather than bending at the hips

3 Lower back should always have contact with the back of the chair

4. Feet crossed, weight resting on the outer borders of the feet.

Correct walking

1 Walk with feet parallel (toes pointing ahead) with weight on the outer and forepart of the feet

2 Walk tall

Method of correcting posture.

1. Wall test:

(a) Stand with heels, hips, shoulders and head against wall.

(b) Slide hand in space between wall and lower back.

(c) Press lower back against hand

(d) Walk away from wall in this posture.

Detailed instructions for performance of corrective exercise in the treatment of postural defects like weakness and pronation of the feet, lumbar lordosis and scoliosis, etc, and surgical conditions such as fractures, dislocations, sprains or strains are given by Coulter, Krusen and other writers and the reader should refer to the excellent treatises written by these authors

Exercises for the treatment of a few medical diseases such as asthma, arthritis, cardiac disease and certain nervous conditions are described below:

Asthma—The Asthma Research Council, London, has published a booklet containing expiratory exercises for asthma The nasal passages should be cleared before commencing the exercises During inspirations which should be short the upper part of the chest should be immobilized as much as possible to increase abdominal breathing. During expirations which should be prolonged the abdominal muscles should be drawn in. On no account should a deep inspiration be taken during the exercises, but the expiration should be prolonged as long as possible The more important of the exercises recommended are.

1 *Abdominal Breathing*—Lie on the back with the knees drawn up, the body relaxed and one hand resting on the upper portion of the abdomen Exhale slowly while gently sinking the chest and then the upper abdomen while it is well retracted at the end of expiration Now relax the upper part of the abdomen so that it bulges forward slightly while taking a deep inspiration through the upper part of the nose The chest is not raised This exercise should be repeated eight to sixteen times, then after a rest of a minute, a second series should be performed

2 *Side-expansion Breathing*· Sit relaxed in a chair—Place a belt around the lower portion of the thorax Exhale slowly, sinking first the upper part, then the lower part of the thorax and finally compress the lower ribs slightly by tightening the belt again This exercise should be repeated in the same fashion as the first exercise

3 *Side-expansion Breathing for Children*—This exercise is similar to the exercise just described, with the exception that the palms of the hands are substituted for the belt The patient should sit relaxed with the palms placed on each side of the lower ribs Then exhale slowly through the mouth, contracting the upper part of the thorax as much as possible and then contracting the lower ribs Finally, the thorax is compressed between the palms to assist in the expulsion of air from the bases of the lungs Then inhale, expanding the lower ribs against a slight pressure from the hands The hands are kept in place at all times but the arms and shoulders are relaxed except when needed for pressure The exercise is repeated as are the previous ones

4 *Elbow Circling*—This exercise is to be performed between breathing exercises Sit leaning forward at the hips with the back straight, with the fingers on the shoulders and with the elbows level with the shoulders Carry

Sister Kenny's treatment has been evaluated by a British Committee of seven orthopedists who observed her work while she demonstrated her methods in England for a period of one year. Their conclusions are:

"1. We have seen no reason to admit Miss Kenny's claim that complete cure can be promised in any group of cases of poliomyelitis

"2 We consider that the use of hydrotherapy in the form of hot and cold douches as practised by Miss Kenny is of value.

"3 We consider that very early attempts to initiate voluntary movements and also early and frequent passive movements are harmless but of unproved value. We think, however, it is a legitimate criticism of her method generally that it does not include a number of useful measures practised certainly in this country, by experienced members of the massage profession

"4 We agree with Miss Kenny that under certain conditions, which we have specified, splints can be dispensed with in the treatment of early stages of the disease We do not approve, however, of her entire abolition of splints and surgical appliances in treatment We consider that they are often valuable and sometimes essential parts of treatment, but, on the other hand, we are equally sure that the mechanical methods which she employs in substitution for splints are inadequate We would add, however, that we disagree with the long periods of continuous mechanical immobilization which are sometimes imposed

"5 We consider that Miss Kenny has not really faced the issue of residual paralysis, for which we believe surgical appliances or surgical methods such as stabilizing operations offer the only eventual hope of amelioration

"6 Some improvement appears to have been achieved in the cases of cerebral spastic paralysis treated, but Miss Kenny's system demonstrates no *original principles* "

Cerebral Palsy—As prophylactic treatment vitamin K should be given to the mother 12 hours before delivery A second dose should be given to the child about the second day after birth Once cerebral palsy has developed, if the child has normal mentality, prolonged corrective exercises should be prescribed For the home treatment of such cases the parent should be guided by Girard's handbook on the home treatment of spastic paralysis for spastic cases and Fischel's "the spastic child" for athetosic cases. For athetosic cases, co-ordination and rhythm exercises should be stressed; for spastic cases stretching exercises and measures to prevent or correct deformities should be employed in combination with training in relaxation and co-ordination.

Ataxia—In the management of ataxia associated with subacute combined degeneration or tabes, co-ordination exercises are of value. These should be performed at first in the recumbent position and thereafter in the sitting and erect positions. Suitable exercises are described by Krusen.

Hemiplegia—One week after the onset of hemiplegia, daily gentle massage and passive movements should be inaugurated As soon as a little power

returns, voluntary movements should be commenced. The routine series of exercises for both upper and lower limb should be repeated three times a day Active movements of single joints are attempted at first. Next the patient holds one joint in a corrected position while exercising an adjacent joint. When two adjacent joints are under the patient's control, endeavour to control three or more joints should be made, progressing finally to the control of the entire limb The object of treatment is to strengthen the weak muscles and to improve co-ordination

Surgical indications for therapeutic exercises are following traumatic injuries (fractures, dislocations and sprains) It is usual to immobilize the injured part until healing has progressed to a point at which massage and movement can be commenced. For details of treatment, the reader is referred to special text-books on the subject.

CHAPTER V

RECENT PROGRESS IN THERAPY

ANTIBIOTICS

Antibiotics are chemical entities produced by certain micro-organisms that depending upon their concentration in the medium, inhibit, kill or lyse other micro-organisms They may be derived from all kinds of organisms, actinomycetes (aureomycin, chloromycetin, streptomycin, terramycin), bacteria (bacitracin, gramicidin, polymyxin, tyrothricin), fungi (penicillin), algæ (chlorelin), lichens (usnic acid) and resins (lupulon).

Penicillin

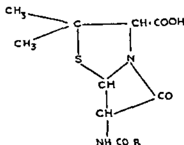
A chance contamination of a culture plate of a staphylococcal variant in Fleming's laboratory led to the discovery of the wonder drug penicillin. The commercial production of penicillin was the fruit of the combined efforts of Florey, Chain, Heatley and a large number of scientists, manufacturers and Government agencies in the States.

Penicillin is produced by different strains of P Notatum, P. Chrysogenum and certain other molds Originally it was produced in shallow flasks by the surface culture method. For large scale production the United States Department of Agriculture developed the submerged culture method which is at present universally employed For the submerged method the strain of the fungus used as seed is NRRL 832 This is sown in to the medium (Czapex-Dox medium or in commercial practice corn steep liquor containing inorganic salts, lactose and various organic substances which embody in their molecular structure moieties of the specific penicillin desired) in large fermentation tanks under sterile conditions. The optimum temperature for growth is between 20 and 26°C Production is greatly influenced by the reaction of the medium being maximum at pH 7 or slightly below the neutral point. Penicillin grows aerobically and sterile air is introduced under pressure in a highly dispersed state through spargers. The mold grows in the form of small pellets or spheres which are distributed throughout the medium When the peak of production has been attained the antibiotic is recovered by filtration in rotary drum filters. It is subjected to a number of physico-chemical processes, concentrated and freeze-dried. As at present marketed crystalline penicillin G sodium has a potency of 1667 units per mg

Chemistry—Penicillins are amorphous, crystalline, biosynthetic and synthetic. Amorphous penicillin is soluble in ether and acetone. It is moderately soluble in chloroform and only slightly in benzene and carbon tetrachloride In water it is soluble to the extent of 0 5 per cent Amorphous penicillin is thermolabile Its stability is maximum when it is dry and minimal in the presence of moisture or when it is in aqueous solution. It rapidly loses its antibiotic properties in solution even at low temperatures, at a pH below 3 or above 8 5. Barium salt of penicillin and crystalline penicillin G sodium or

potassium salt is heat stable Penicillin is inactivated by heavy metallic ions such as copper, lead, mercury, silver, zinc and cadmium. It is also inactivated by alcohol, acids, alkalies, oxidising agents like hydrogen peroxide and potassium permanganate and, the enzyme penicillinase.

Shortly after large scale production of penicillin it was discovered that therapeutic response to penicillin prepared in different ways and by different firms was not uniform. This is due to the presence in the culture fluid of different types of penicillin, designated as F, G, X, K, Dihydro F-penicillin and penicillin O These types are identifiable chemical compounds with different antibiotic spectra and can be distinguished from one another by the character of the side chain R attached to a common lactam nucleus



Penicillin F or I is pentinyl penicillin and the side chain R is represented by $CH_2CH=CHCH_2CH_3$ It is the type produced by the original surface culture strains used in England Penicillin G or II is benzyl penicillin (side chain—CH_2 ⬡) and is the one produced in largest amount by more recent surface culture strains and by the submerged culture strain first used in the U. S A Penicillin X or III is P-hydroxyl benzyl penicillin (side chain—CH_2 ⬡ OH) and is said to be more effective in the treatment of gonorrhea. Penicillin K or IV is n-heptyl penicillin [side chain $CH_3 (CH_3)$], and gets bound to serum protein to a greater degree than penicillin G. It is relatively rapidly destroyed in the body. Dihydro F-penicillin is n-amyl penicillin. Penicillin O is allythio-methyl penicillin and has recently been placed on the American market Its special usefulness is in patients sensitive to penicillin G Another variety of penicillin is its n-methyl-1,2-diphenyl-2-hydroxyethylaminesalt (compenamine-CSC) indicated for patients known to be sensitive to other forms of penicillin.

Crystalline penicillin is heat stable and may withstand heating to 100°C for 96 hours. Addition of 4 per cent sodium citrate to solutions of crystalline penicillin renders them more stable. Buffered solutions lose only 5 to 10 per cent in potency in 48 hours as compared to unbuffered solutions which lose approximately 50 per cent. Buffered solutions may retain full potency for a period of seven days under conditions of refrigeration

Biosynthetic Penicillins—Many new crystalline biosynthetic penicillins have been isolated in recent years; eleven such were reported by the Lilly Research Laboratories in 1947.

The production of benzyl penicillin is also considerably increased by the use of what are called chemical *intermediates* or *precursors*.

Synthetic Penicillins—At the outset of the synthetic work three different formulæ were considered as likely for penicillin. These came to be known as the B-lactam formula, the tricyclic formula and the thiazolidine-oxazolone formula. Although the last received by far the greatest attention to begin with, sufficient evidence accumulated in the end to show conclusively that B-lactam formula for penicillin was the correct one.

Unitage—The International Standard Unit is that activity which is present in 0 6 mg. of the international pure standard crystalline sodium salt of penicillin G One milligram of penicillin G contains 1667 units.

Assay—The methods commonly employed are agar diffusion methods and the serial dilution methods and the test organism employed is the staphylococcus N.C T.C 6571A or N C T.C. 6718. Other methods of assay include a biochemical, a titrimetric, an iodometric, a spectrophotometric, a polarographic and a colorimetric method. The U.S P. XIV method of assay for penicillin G is a chemical semi-micro method which requires 60-70 mg of the salt. The n-ethyl piperidine derivative is made, precipitated under suitable conditions and weighed. From the weight of this n-ethyl piperidine derivative, the penicillin G content of a given sample can be calculated.

Penicillin Sensitivity of Pathogens

Many infections with well defined clinical features can be identified as due to penicillin sensitive organisms and treatment instituted without preliminary resort to sensitivity tests. In some cases it is necessary to culture the organism and test it in-vitro against penicillin The method recommended is the agar diffusion method. Two cylinders are placed on the more thickly planted portion of the culture plate and filled with penicillin in a strength of 5 and I unit per ml., respectively. After incubation the size of the zones of inhibition are measured. A control can be set up by streaking the standard staphylococcus across the plate up to the cylinder.

Diadiscs (C S C.), diagnostic test tablets *for determining sensitivity to* antibiotics are now available. Each small tablet contains a measured amount of antibiotic. In a complete set are included 24 test tablets of two potencies of the following antibiotics: penicillin, bacitracin, streptomycin, chloramphe- ', aureomycin and terramycin. The organism in question is streaked over a petri plate and then the diagnostic tablets are placed on the plate equidistant from each other and the zones of inhibition which are in direct proportion to antibiotic sensitivity, are measured. A specially prepared sensitivity chart gives the practical significance of these inhibition zones thus enabling the physician to determine which antibiotic will produce the maximum therapeutic effect.

Penicillinase

Penicillinase is an enzyme-like substance produced not only by penicillin resistant organisms like Escherichia coli but also by some penicillin sensitive organisms such as B subtilis It is of value in that its addition to blood, C S fluid, pus or urine containing penicillin will neutralize the latter and allow of cultivation of bacteria from these fluids Penicillinase interferes with penicillin treatment in two ways, firstly when penicillinase producers contaminate preparations of penicillin, they can rapidly destroy its activity and secondly, when large numbers of penicillinase producers are present in lesions associated with penicillin-sensitive organisms, the latter may be protected

Penicillin Resistance—Resistance to penicillin has been reported with staphylococci but with no other organism Barber and Whitehead (1949) reported that 14 1 per cent of staphylococcal infections yielded penicillin-resistant strains in 1946, 38 per cent in 1947 and 59 per cent in 1948 An incidence of 40-60 per cent is reported by other workers Development of resistance has been attributed to a selective propagation of penicillinase-producing strains that are already present in small numbers in any population of organisms, the sensitive individuals being eliminated by virtue of the suppressive action of penicillin or the appearance of resistant variants in cultures of susceptible strains as a result of random mutation constantly occurring in bacterial populations

Infections from which penicillin resistant staphylococci have been isolated should be treated with massive doses (2-5 million units daily) of penicillin

Pharmacology—Pharmacologically penicillin is an inert substance and has the widest margin of safety of any known drug Doses in excess of those used in treatment have little effect on heart or respiration when injected intravenously A concentration of 1 in 5500 was found to have no significant effect on the isolated ileum or uterus of the guinea pig

Van Dyke (1944) reported that crystalline sodium penicillin G was non-hemolytic

Fleming (1947) found that both amorphous and crystalline penicillin retarded the clotting time of normal human blood

Absorption, Distribution, Excretion—Penicillin in aqueous solutions is rapidly absorbed when administered intravenously or intramuscularly and somewhat more slowly when administered subcutaneously The peak concentration in the blood is reached immediately after intravenous injection and within one hour after intramuscular injection Blood levels persist for from 2 to 3 hours after doses of less than 50,000 units intramuscularly and somewhat longer with larger doses Penicillin in oil or procaine penicillin are absorbed more slowly and blood levels persist for 12 to 24 hours When procaine penicillin G in oil with 2 per cent aluminum monostearate is injected intramuscularly, blood concentrations are said to persist for as long as 96 hours

Penicillin while not absorbed from the stomach is readily absorbed from the duodenum and upper part of the intestines. Approximately five times the

intramuscular dose is required to produce comparable blood levels Antacids and buffers decrease the destructive effects of the gastric juices and absorption is best when the stomach is empty. When aerosol penicillin is inhaled *absorption takes place in the lungs and both systemic and local effects* are obtained Penicillin is also absorbed from infected cavities. Florey and Heatley have shown that if 120,000 units of penicillin are injected into an empyema cavity after aspiration, a therapeutic level of penicillin is maintained in the blood for *21 hours. A similar though less prolonged effect follows injection into* an abscess cavity, an infected joint and into the theca

Rectal administration is ineffective as penicillinase producers in the lower *bowel inactivate penicillin*

Penicillin is distributed throughout the body fluids but penetrates the joints, pleura, peritoneum, and subarachnoid space irregularly. Penetration *is more likely to occur if inflammation exists. Penicillin persists in the tissues* for a considerable time after it has disappeared from the blood Hence continuous blood levels are not necessary in most infections.

Penicillin passes the blood placental barrier.

Approximately 60 per cent of injected penicillin is excreted in the urine The greatest part is excreted in the first hour after injection; diminishing *quantities are found in the urine thereafter for as long as 7-12 hours* With a daily dose of 100,000 units concentration in the urine in a 24 hour specimen may easily attain a value of 40 units per c c. Approximately 80 per cent. of urinary excretion is tubular and may be partly blocked by such agents as caronamide, para-aminohippuric acid, diodrast and benemid.

Mode of Action—The exact mechanism of the antibiotic action of penicillin is not known Fleming believed penicillin to be bactericidal; Florey and Florey thought that penicillin in chemotherapeutic doses was only bacteriostatic. Penicillin is now believed to be both bacteriostatic and bactericidal. Unlike sulfonamides, penicillin is active in the presence of pus, blood, serum and tissue lysates The bactericidal effect is enhanced by an increase in temperature from 4°C to 42°C and impaired by an increase in the acidity of the medium Penicillin is most active in media and environments in which active multiplication occurs It affects a metabolic function of the bacteria during the early stages of their development. It will kill a large number of bacteria of a susceptible species, but it does not always kill all the bacteria present. A few resistant cells may remain that are capable of multiplication, giving rise to a resistant culture A feature of penicillin action that merits attention is the occurrence of postlytic waves of growth. As the more sensitive organisms undergo lysis, they release into the medium substances which promote a second wave of growth among the more resistant cells, thus inducing the latter into a more active metabolic state in which they are more susceptible to the action of penicillin Therefore the course of events in a culture exposed to penicillin might be visualized as similar to a "chain reaction."

Light is thrown on the mechanism of action of penicillin by morphological and cytochemical observations In a penicillin assay plate seeded with staphylococci, surrounding the penicillin cylinder, several zones may be distinguished Immediately surrounding the cylinder is the cidal zone Outside this is a zone of inhibition surrounded by a narrow zone of stimulation or increased activity and beyond this lies the uninhibited zone in which the bacteria grow and divide normally By using suitable reagents that give colour reactions with specific reactive chemical groups, tests have been made for, —SH, aldehyde, dienol, lipids, phospho-lipids, various nucleic acid fractions, amino-acids and among enzyme systems dehydrogenase, indophenol oxidase and phosphatase In the inhibition zone there is no positive response for reducing groups, dehydrogenase, alkaline phosphatase and sulfur containing amino-acids Positive response is obtained for indophenol oxidase. The mononucleotides also accumulate in this region In the uninhibited zone there is a positive response for reducing groups, dehydrogenase, alkaline phosphatase and sulfur containing amino-acids

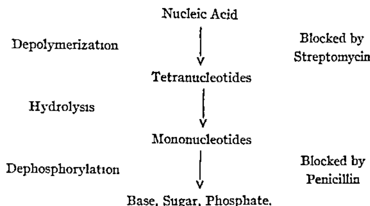
Staphylococci under the influence of penicillin starve to death as their vacuolar material is not only unable to absorb essential nutrilites from the surrounding environment but is unable to retain the solutes it possesses The cell respiration becomes unbalanced, there is loss of positive gram-staining and disorganization of cellular nucleoproteins with liberation of fatty acids The bacterial cell swells and if it is stained with vital red, it is seen that the vacuolar material diffuses to the periphery The cell fails to divide and eventually swells into an empty shell which exhibits diffuse bipolar peripheral staining

It is well known that the growth of staphylococcus aureus depends on an external source of —SH groups such as presumably may be converted to cysteine and on an external source of glutamic acid. These facts, together with the results of tests with *various reagents suggest, that glutathione, resulting from* the linkage of glutamic acid to glycine via cysteine, may be involved in the mechanism of bacteriostasis of gram-positive organisms by penicillin. Staining reactions on the assay plates point directly to the involvement of glutathione When assay plates are flooded with a one per cent solution of 2,6-dichlorophenol indophenol in a saturated aqueous solution of sodium bicarbonate, the inhibition zone promptly stains intense blue due to lack of response for reducing groups The uninhibited zone where reducing groups are present stain a faint blue. The narrow zone of increased activity on account of presence of a large number of reducing groups remains colourless

The moral of these observations is that over all effects of penicillin may be traceable ultimately to irreversible dehydrogenation of reduced glutathione to oxidized glutathione (—SH to S—S groups) resulting largely from the increased rate of metabolism that is induced by appropriately low concentration of penicillin.

The normal sequence of events in the degradation of nucleic acid complexes takes place in three steps involving depolymerization of the nucleic acid macromolecules to tetranucleotide units which are hydrolyzed to mono-

nucleotides which in turn are dephosphorylated with consequent release of base, a sugar and phosphate.



Cytochemicalstudies (staining by trypan blue) show that penicillin interferes with dephosphorylation of mononucleotides which consequently accumulate in the zone of inhibition by penicillin

The close relationship between inhibition of mononucleotides and disappearance of positive response for —SH groups might be expected, since the micro-organisms depend on liberation of free base from the mononucleotide for the maintenance of the redox potential at a level low enough for glutathione to be reversibly oxidized and reduced. When the catabolism of mono-nucleotides is blocked by penicillin, the base can no longer be liberated to function in poising the internal redox potential

Penicillin, therefore, can be seen as exerting its bacteriostatic action by blocking the system whereby the redox potential is normally maintained low enough for the —SH groups to be protected from irreversible dehydrogenation

Factors Modifying Penicillin Action :

1 *Sensitivity of the Infecting Organism*—Only the gram-positive cocci and a few other organisms are sensitive to penicillin A large number of bacteria, rickettsial bodies and viruses are insensitive. In mixed infections in which the primary infecting agent is gram-negative, use of penicillin, by eliminating the gram-positive bacteria, may favour multiplication of the gram-negative In such cases mixed therapy with penicillin and another suitable chemotherapeutic agent is called for.

2. *Number of Organisms Initially Present*—This is important both with sulfonamides and streptomycin For all practical purposes this factor is of little importance in treatment by penicillin

3 *pH of the Medium*—Penicillin in solution deteriorates rapidly as the pH of the solution deviates from the range of approximately 6 0—6 8. Fortunately the normal tissues subject to invasion by penicillin-sensitive organisms are within a range in which penicillin is stable and effective

4. *Presence of Inhibitors*—As early as 1940, Abraham and Chain isolated from Eschericia, a substance which completely inhibited the activity of penicillin

This substance, they called penicillinase. Penicillinase is also produced by some resistant strains of staphylococcus aureus and some penicillin sensitive bacteria like the B. subtilis It is clear therefore that resistance or sensitivity to penicillin is not merely a matter of whether or not an organism produces penicillinase. When penicillin treatment is combined with chloromycetin, the result is an inhibition

5 *Presence of Enhancing Factors and Synergists*—Partially purified penicillins contain certain factors the addition of which to crystalline penicillin enhance its activity Recently a polycyclic acid, named borrelidin, has been isolated from amorphous penicillin inactivated by boiling in methanol When this substance is administered in appropriate amounts to experimental animals along with crystalline penicillin, it not only enhances several fold the activity of penicillin but also renders it effective in infections due to Eberthella typhosa or E coli, organisms not normally susceptible to penicillin For maximum enhancement borrelidin should be added to penicillin in the same proportion in which it occurs in partially purified penicillin When it is added in larger amounts than this, it inactivates the penicillin The action of penicillin is also enhanced by additions of cobalt chloride and vitamin K.

Recently synergism has been reported between penicillin and other drugs or antibiotics Penicillin and bacitracin have been shown to be more effective than either antibiotic alone in certain diseases such as subacute bacterial endocarditis A combination of the two, penitracin is marketed by C. S C Pharmaceuticals Penicillin has been combined with dihydrostreptomycin by Charles Pfizer (Combiotic) and P D & Co (Penicillin Dihydro), for synergistic effect in mixed infections due to gram-positive and gram-negative infections Recently penicillin has been made available in combination with sulfonamides Examples of such combination are Biosulfa (Upjohn), Neotrozine (Lilly) and Pentresamide (Sharpe and Dhome)

6 *Type of Penicillin*—The action of penicillin used is also modified by the type used Penicillin X is more active against gonococcal infections than penicillin G and samples containing large percentage of penicillin K are relatively inactive when compared with benzyl penicillin

Preparations—The following preparations are employed

1 Crystalline penicillin G (sodium or potassium)

2 Penicillin oil and bee's wax (300,000 units per ml)

3 Procaine penicillin in oil (300,000 units per ml).

4 Procaine penicillin in oil with two per cent aluminum monostearate (300,000 units per ml).

5 Procaine penicillin G aqueous (400,000 units per ml)

6 Penicillin esters (Estopen—Glaxo)

7 Penicillin aerosol (100,000 units per cartridge)

8 Penitracin (C. S. C. Pharmaceuticals) contains penicillin and bacitracin.

9 Penicillin Dihydro (P. D. & Co.), is a combination of penicillin and dihydrostreptomycin

10 Pentresamide (Sharpe and Dhome) is a combination of penicillin with a sulfonamide

11 Penicillin Cream Sterilized (B.P.) is made as follows:

Sodium penicillin	...	50,000 units
Emulsifying wax	...	7 Gm.
Hard paraffin	...	5 Gm.
Liquid paraffin	...	41 Gm.
Sterilized water	...	47 ml.

The emulsifying wax and paraffin are melted together with gentle heat, transferred to wide mouthed bottle and cooled to 60°C. Forty millilitres of sterile water warmed to 60°C are added. The bottle is closed and shaken to emulsify It is placed in an autoclave, heated to 115°C for 30 minutes, then removed and cooled to 60°C A solution of 50,000 units of penicillin in the remainder of sterilized water is added, the bottle closed, shaken and rapidly cooled As it contains water, it should be freshly prepared each time. It may be kept in a refrigerator at 4°C for a week without serious loss of activity.

A pourable cream may be made by using emulsifying wax 3 5 Gm., liquid paraffin 15 Gm and sterilized water 81·5 millilitres.

12 Penicillin ointment (500 units per Gm.) is made as follows:

Calcium penicillin	...	500,000 units
Ointment of wool alcohols	...	100 Gm

The base is heated to 110°C for one hour to drive any moisture. It is cooled and triturated in a sterilized mortar and pestle with penicillin As it does not contain water, it is more stable than the cream.

13 Oculentum penicillini (1000 units per Gm.):

Calcium penicillin	...	100,000 units
Yellow soft paraffin	...	90 Gm.
Wool fat	...	10 Gm.

14 Penicillin lozenges (500—5000 units per lozenge). The lozenges must not be crushed with teeth or sucked.

15 Penicillin tablets oral (50,000 units of aluminum penicillin and 0 3 Gm sodium benzoate).

16 Penicillin eyedrops:

Penicillin calcium	...	10,000 units
Solution for eyedrops	...	120 minims

Solution for eye drops is made as follows :

Methyl hydroxybenzoate	...	gr 2
Propyl hydroxybenzoate	...	gr. 1
Sterilized, cooled water	...	20 oz.

The drops retain their activity for 7 days, if stored in a cool place

17 Penicillin lamellæ (500 units)

18 Penicillin spray (100,000 units per ml)

19 Penicillin insufflation powder. It is made by mixing sterile sulfathiazole and calcium penicillin aseptically and dispensing in narrow mouthed, screw capped bottles The mixed powder should contain 5,000 units per Gm for wounds and 500 units per Gm for burns Sterile lactose (heat to 150°C for one hour) is a suitable diluent

20 Penicillin snuff 100,000 units of calcium penicillin in 10 Gm of dextrose).

21 Penicillin ephedrine tablets (solutions prepared according to directions for intranasal use).

22 Penicillin chewing gum (5,000 units)

23. Penicillin dental cones ·

Penicillin calcium	...	1,000 units
Sulfathiozole	..	Gm ½
Sulfanilamide	..	Gm ½

24 Penicillin tooth powder (500 units per Gm)

25 Penicillin tulle (160 units per sq inch of dressing)

Dosage and Methods of Administration

Continuous Intravenous or Intramuscular—This method is only rarely employed and in conditions in which high and continuous blood levels are desired. The relationship between the dose administered and the blood level is shown by the following table from Garrod

Dose in units per hour.		Blood level in units per ml
3,750	.	0 06
4,700	..	0 125
7,000	..	0 25
10,000	...	0 1-0 4
20,000	...	0 23-0 25
25,000	...	0 5
40,000	...	1 0
100,000	...	2 3

For intravenous drip, the leg veins are usually selected. The antecubital veins are also satisfactory but as the drip may continue for some days the restriction on patient's movement is considerable. When it is necessary to change the needle, a vein in the proximity of the opposite ankle is selected. For intramuscular drip the lateral aspect of the thigh is best.

Intermittent Intravenous or Intramuscular—Peak blood concentrations are attained immediately after intravenous injections and rapidly after intramuscular injections and little advantage is gained by intravenous therapy. Consequently the intermittent intramuscular is to-day the most popular method of administration. The dose and the frequency of administration of penicillin depend upon the preparation used and the nature and the severity of infection. From 10,000 units to several million units may be injected every 3 hours. This remains to be the method of choice in most severe, acute infections. In many infections excellent results can be obtained by injections of 100,000 units every 6 hours or 300,000 units every 12 hours. Intramuscular injections of 300,000 to 600,000 units of procaine penicillin G oily or aqueous may be made every 12 or 24 hours. The aqueous procaine penicillin 300,000 units with 100,000 units of crystalline penicillin is now marketed by a number of manufacturing houses. Intramuscular injections of 400,000 to 800,000 units of any one of these are recommended to be made once every day in most infections of average severity and in the treatment of syphilis. Procaine penicillin in oil with 2 per cent aluminum monostearate is said to produce effective blood levels for periods ranging over 96 hours. This is, however, contested by some British authorities who recommend that doses of this preparation must be given once every 24 to 48 hours.

Oral—A large part of the penicillin taken orally is destroyed by the acid of the gastric juice. A second factor of importance in this regard is that penicillin absorption from the duodenum and the upper part of the small intestine is very erratic. For effective blood levels, therefore, 5 to 10 times the parenteral dose is necessary. The drug is best given before food on an empty stomach. Its greatest value is in infants owing to low hydrochloric acid content of their gastric juice, in patients who have also achlorhydria and in infections caused by highly sensitive organisms. In severe infections of any kind and in those caused by less sensitive bacteria like staphylococci, only the more dependable parenteral administration should be employed. Tablets of 50,000 or 100,000 units with sodium benzoate are marketed and 500,000 units may be administered three hourly. The oral dose of sodium benzoate inactivates penicillinase and prevents the destruction of penicillin in the intestinal tract.

Topical—

(a) *Aerosol*—A solution containing 100,000 units per ml. may be aerosolized every 3 to 8 hours by means of vaponephrin or *Devilbiss-40*, nebulizer. In the Collison atomizer a jet of oxygen is led through the penicillin solution to the patient who inhales through a mask. Penicillin powder in cartridges of 100,000 units may be aerosolized through special inhalors marketed by Abbot (Aerohalor), Ledrle

(Pennilator) and Squibb (Dispolator). Aerosol therapy is usually employed in upper respiratory tract infections or conditions like chronic bronchitis or bronchiectasis, but appreciable blood levels frequently result.

(b) *Intraspinal*—Although penicillin may penetrate the sub-arachnoid space after intramuscular injections, the total dosage required for this purpose has to be enormous It is said that a dose of approximately 25 mega units (25,000,000 units) in the blood will give the same effect in the meninges as 500—1,000 units injected directly into the theca It is, therefore, important that in meningitis due to susceptible organisms, 10,000 units of penicillin dissolved in 10 c c of normal saline are injected intrathecally once a day until the C S fluid sugar content becomes normal Intramuscular injections are also given in the usual way

(c) *Intrapleural*—Direct injection into the pleural cavity produces a more satisfactory and a more rapid result in patients suffering from empyema A dose of 500,000 units in 50 c c is injected after each aspiration

(d) *Intra-articular*—As in empyema and other infected cavities like abscesses, the joint is aspirated and a penicillin solution injected

(e) Penicillin ointments, creams, solutions, lamellæ and lozenges are used for topical therapy of wounds, sinuses, burns, skin diseases, eye trouble and local conditions in the mouth

Toxic Effects—For all practical purposes purified penicillin has no untoward effects Pain at the site of injection and thrombophlebitis after continuous intravenous infusion are attributable mainly to impurities and are now rare A transient pruritus and urticaria occur in about 10 per cent of the cases especially after topical or oral use Among other symptoms of hypersensitivity reported are periorbital or labial edema, edema of the hands, drug fever, gastrointestinal reactions, headache, eosinophilia, faintness, generalized arthalgia, and myalgia Asthmatic attacks, anaphylaxis and serum sickness have been encountered in patients with a previous history of allergy or a history of fungus infection The reactions are never serious and do not call for cessation of therapy If necessary the brand may be changed or antihistamine drugs administered

It is now agreed that local treatment of brain tissue by penicillin gives rise to pronounced toxic effects Intracisternal injection of 30 000 units is considered dangerous by Johnson and Walker (1945) and may give rise to stimulation, twitching and convulsions Rammelkamp and Keefer recorded only headache, nausea and vomiting following intracisternal injection of 10,000 units in patients Russel and Beck (1946) caution against the use of concentrated solutions locally on the brain tissue.

Herxheimer reactions may occur in treatment of syphilis with large doses of penicillin. During the first day or two, therefore, dosage should be small

Penicillin therapy is said to increase the clotting time of blood The common practice of placing dry penicillin in a tooth socket following extraction is therefore to be deprecated.

Local irritation of the buccal membrane and the so called "penicillin tongue," a condition in which the tongue becomes covered with a brownish, greenish or yellowish fur, also follow oral administration of penicillin or the use of lozenges

Therapeutic Uses of Penicillin—The action of penicillin is highly selective It is more active both in-vitro and in-vivo, against gram-positive organisms whether ærobic or anærobic, than against gram-negative ones The following table gives the list of organisms which are highly susceptible to the action of penicillin and those which are moderately susceptible or insusceptible.

TABLE 5 SUSCEPTIBILITY OF THE LIVING AGENTS OF DISEASE TO PENICILLIN

Highly Susceptible	*Moderately Susceptible*	*Slightly Susceptible or Insusceptible*
B anthracis	Actinomyces bovis	Aerobacter aerogenes
B subtilis	Anærobic streptococci	Alkaligenes fecalis
Cl oedematiens	Borrelia novyi	Br abortus
Cl welchii	Borrelia recurrentis	Br. melitensis; Br. suis
Cl. septicum	Cl botulinum	"Donovan bodies"
Cl tetani	H. ducreyi	Eberthella typhosa
Cornebacterium diphtheriæ	H influenzæ	Esch coli
Diphtheroid bacilli (most strains)	Leptospira icterohemorrhagiæ	Hemophilus pertussis
Diplococcus pneumoniæ	*Leptospira canicoli*	*Histoplasma capsulatus*
N. gonorrhœæ	N catarrhalis	Influenza virus (PR 8)
N intracellularis	Ornithosis virus	Kleb. pneumoniæ
Staph. albus (most strains)	Psittacosis virus	Koch-Week's bacillus
Staph. aureus (most strains)	Spirillum morsus muris	Lymphopathia venereum virus
Str. pyogenes	Str. fecalis (enterococcus)	Monilia albicans
Str. hemolyticus (except group D)	Str. non-hemolyticus	Morax-Axenfeld bacillus

Highly Susceptible	*Moderately Susceptible*	*Slightly Susceptible or Insusceptible*
Treponema pallidum	Str. viridans	Myco. tuberculosis
Treponema pertenue	Streptobacillus (moniliformis)	Past. pestis
		Past tularensis
		Plasmodium vivax
		Poliomyelitis virus
		Proteus vulgaris
		Ps æruginosa
		R. prowazeki, R. rickettsii
		S enteritidis; S paratyphi
		Shig dysenteriæ
		Shig. paradysenteriæ
		Shig sonnei
		Str fecalis
		Trichomonas vaginalis
		Tryp kruzi, Tryp equiperdum
		Tryp lewisi; Tryp rhodesiense
		Vaccinia virus
		Vibrio comma

Normally in acute infections such as septicemia, pneumonia, gonorrhea, suppurative meningitis or acute osteomyelitis treatment with penicillin is commenced as soon as the patient is seen Only in cases which fail to respond or in which mixed infection with susceptible and non-susceptible organisms is suspected, are bacteriological studies necessary. When a bacteriological diagnosis has been arrived at it is advisable to determine the degree of susceptibility of the infecting organism to penicillin in-vitro. The technic is not at all difficult and has already been described in chapter four The information obtained by these procedures will prove of immense value in determining the dosage, frequency and the route of administration of the antibiotic An infection due to an organism with an unusual resistance is likely to respond to much higher doses than are required for infections by highly susceptible organisms For most purposes a blood plasma level of penicillin between 03 units to 15 units per ml is regarded as effective. The number of diseases due to penicillin-sensitive organisms (gonococci, hemolytic streptococci, pneumococci, staphylococci, meningococci, treponema and clostridia) is very large In table 6 are listed the conditions in which penicillin is either the drug of choice or is like to result in benefit.

TABLE 6 STAPHYLOCOCCAL, STREPTOCOCCAL, PNEUMOCOCCAL, GONOCOCCAL, MENINGOCOCCAL, SPIROCHETAL, CLOSTRIDIAL AND OTHER DISEASE IN WHICH PENICILLIN THERAPY IS EFFECTIVE

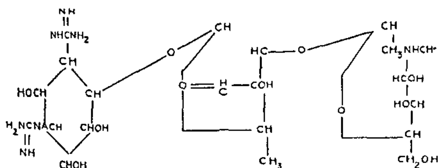
Actinomycosis
Agranulocytosis
Anthrax
Arthritis (suppurative)
Asthma (intrinsis)
Bacterial synergistic gangrene
Balanitis
Blepharitis
Brain abscess
Bronchiectasis
Bronchitis
Burns and scalds
Bursitis
Carbuncles
Cavernous sinus thrombosis
Cellulitis and lymphangitis
Conjunctivitis
Cystitis
Dacrocystitis
Dermatitis
Dento-alveolar abscess
Diphtheria and carriers
Echthyma
Epididmitis
Episcleritis
Empyema
Endocarditis
Endometritis
Endophthalmitis
Erysipelas
Fractures (compound)
Furunculosis
Gaseous gangrene
Gingivo-stomatitis
Hordeola
Impetigo contagiosa
Infectious jaundice (Weil's disease)
Iritis
Iridocyclitis
Keratitis
Labyrinthitis
Laryngotracheitis
Lateral sinus thrombosis
Liver abscess
Ludwig's angina
Lung abscess
Malignant edema
Mastitis
Mastoiditis
Meningitis (suppurative)
Nephritis (acute)
Orbital cellulitis and periostitis
Orchitis
Ornithosis
Osteomyelitis
Otitis media and externa
Panophthalmitis
Parotitis (suppurative)
Pericarditis (suppurative)
Perirenal abscess
Peritonitis
Peritonsillar abscess
Petrositis
Pharyngitis
Pneumonia
Pneumonitis (suppurative)
Psittacosis
Proctitis (gonococcal)
Prostatitis
Prostatovesiculitis
Pulmonary spirochetosis
Pyelephlebitis
Pyelonephritis
Rat bite fever
Relapsing fever
Rhinitis (bacterial)
Salpingitis
Scarlet fever
Septicemia
Septic sore throat

Sinusitis
Skin grafting
Small pox (secondary infections)
Streptococcus carriers
Subphrenic abscess
Sycosis barbæ
Sycosis vulgaris
Syphilis
Thrombophlebitis
Tonsillitis
Tropical ulcer
Ulcerative colitis (some cases)
Ulcers
Urethritis
Uveitis
Vincent's angina
Vulvovaginitis
Wounds
Yaws

STREPTOMYCIN

Streptomycin was isolated from an actinomycete by a group of investigators working under the leadership of Dr Selman Waksman in the year 1944 It was found to be effective against infections due to gram-negative organisms and the myobacterium tuberculosis, infections against which penicillin was of no value

Chemistry—Streptomycin is a base and forms salts with anions This is in contrast with penicillin which is an acid and forms salts with cations It may be considered as resulting from a condensation of streptidine which is 1,3, diguanidine 2,4,5,6 tetrahydroxy cylohexane, streptose and 2-(methylamino) glucose, with elimination of 2 molecules of water as shown in the following figure



Dihydrostreptomycin differs structurally from streptomycin only in that the carbonyl group of the streptose moiety is reduced to an alcohol

Production—The problems of production are similar to those involved in the production of penicillin, viz , the selection of a suitable "seed", the preparation of a suitable sterile medium, biosynthesis by the submerged technic in tanks of 5,000—20,000 gallons capacity under conditions of proper aeration and a suitable pH, harvesting, filtration and purification For the "seed", active strains of streptomyces griseus are continuously selected by industrial producers and the medium employed requires in addition to inorganic salts, a source of carbon and of nitrogen as well as certain precursors. The precursors are present in meat

extract, soyabean flour, yeast autolysate and proline. They are also present in corn steep liquor but it seems desirable to avoid its use in the fermentation liquor as the histamine-like reaction that some patients develop after use of streptomycin has been attributed to some impurities in the corn steep liquor which cannot be removed during the processes of extraction and purification

Assay Unitage Stability—Streptomycin assay involves principles similar to those involved in assay of penicillin. The test organisms employed are standardized strains o Escherichia coli and Bacillus subtilis

A unit is one microgram of streptomycin base and a gram of this substance is equal to 1,000,000 units

As compared with penicillin, streptomycin is remarkably stable both in the dry state and in solution under ordinary conditions of storage Both streptomycin base and the commercial salts are hygroscopic and should be protected from moisture during storage The rate of deterioration is augmented by the impurities present and by the moisture At room temperature reasonably pure and dry salts of the antibiotic are stable for atleast 18 months, and probably for much longer periods of time. For streptomycin solutions, however, refrigeration is desirable Streptomycin is subject to destruction by acids and alkalies, cysteine; lipositol, hydroxylamine hydroxide; certain reducing agents such as NaH_2PO_4, $NaHSO_3$, $SNCl_2$ and NaH_2SO_4; the cyanate ion and oxidising agents such as $KMNO_4$, HNO_3, KIO_4, H_2O_2 and $HClO_3$

Antibacterial Activity In-vitro

The greatest usefulness of streptomycin lies in its effectiveness for the therapy of certain infections In table 7 are listed pathogenic micro-oganisms and their relative in-vitro sensitivity to streptomycin. Micro-organisms the growth of majority of which is completely inhibited by less than 10 0 g streptomycin per ml. are regarded sensitive, those the growth of majority of which is inhibited by between 10 0 and 100 0 g. streptomycin per ml are regarded as moderately sensitive and those requiring more than 100 0 g of streptomycin per ml to inhibit are regarded as insensitive.

Sensitivity in-vitro of Pathogenic Micro-organism to Streptomycin

SENSITIVE

Actinomyces
Bacillus anthracis
Brucella abortus
Brucella melitensis
Brucella suis
Donovania granulomatis
Hemophilus pertusis
Hemophilus influenzæ
Klebsiella pneumoniæ
Leptospira icterohæmorrhagiæ
Mycobacterium tuberculosis, var. hominis
Mycobacterium tuberculosis, var. bov
Neisseria gonorrhœæ
Neisseria meningitidis (Neisseria intracellulairs)
Pasteurella pestis
Pasteurella tularensis
Aalmonella typhosa (Eberthella typhosa)
Shigella dysenteriæ
Shigella paradysenteriæ
Streptobacillus moniliformis

MODERATELY SENSITIVE

Aerobacter aerogenes	Proteus vulgaris
Alcaligenes fæcalis	Pseudomonas æruginosa (bacillus pyocyaneus)
Corynebacterium diphtheriæ	Rickettsia akari
Diplococcus pneumoniæ	Rickettsia prowazekii
Escherichia coli	Rickettsia typhi (Rickettsia mooseri)
Hemophilus ducreyi	Streptococcus, alpha hemolytic
Malleomyces mallei	Streptococcus, beta hemolytic
Micrococcus pyogenes, var albus (Staphylococcus albus)	Streptococcus fæcalis
Micrococcus pyogenes, var aureus (Staphylococcus aureus)	Vibrio choleræ (vibrio comma)

INSENSITIVE

Clostridium species	Virus of mumps
Malleomyces pseudomallei	Virus of psittacosis
Rickettsia tsutsugamushi (Rickettsia orientalis)	Coccidioides immitis
Virus of human influenza	Histoplasma capsulatum
Virus of lymphogranuloma venereum	Endamoeba histolytica
Virus of meningo-pneumonitis	Trichomonas vaginalis
	Trypanosoma species

It is apparent from the table that a large number of pathogenic organisms are highly susceptible in-vitro to the antibiotic action of streptomycin The most notable examples are the Myobactrium, Pasturella, Brucella, Hemophilus, Salmonella, Klebsiella, and Shigella organisms It cannot be assumed, however, that species of micro-organisms highly susceptible in-vitro to the antibiotic action of streptomycin will be equally susceptible in-vivo This is well illustrated by the relative ineffectiveness of streptomycin in treatment of Brucellosis, Salmonella and Shigella infection in man.

Methods for Testing Streptomycin Sensitivity

1 **Indirect Methods**—The test organism is subcultured after original isolation and used as a pure culture.

(a) *Liquid Medium*—Dilutions of streptomycin 100,50,25,12 5,6·25,3 13, 1 56,0 78 and 0 μg/ml of the medium are prepared. Each tube is inoculated with the test organism and incubated, usually at 37°C for 18 to 24 hours. Myobacteria will require a much longer period of incubation The method is recommended for laboratories which perform streptomycin tests infrequently.

(b) *Solid Medium*—Agar media are prepared with varying concentrations of streptomycin as described under liquid media. The media are distributed in sterile petri dishes, and a number of different strains of bacteria inoculated on the same plate. The method is recommended for laboratories that perform many tests.

2 **Direct Method**—Matter from infectious processes is inoculated directly on solid media containing streptomycin Th· method has found its greatest application in the determination of streptomycin sensitivity of tubercle bacilli, often shortening by several weeks the time involved. The material to be tested such as the sputum, is first digested to homogenize the specimen and to eliminate contaminating organisms It is then concentrated and inoculated on tubes of egg-yolk agar previously prepared to contain varying concentrations of streptomycin 100,12 5,1 5 and 0 μg ml If large numbers of tubercle bacilli are present in the specimen, results may be evident within 2 weeks of incubation. A standard strain of bacteria may be run in parallel with other organisms, to be used as basis for calculation of end points.

Development of Resistance

Bacteria develop resistance to streptomycin much more quickly than to penicillin or other antibiotics This fact has a practical importance both for the physicians and the bacteriologists particularly those engaged in bacterial genetics Resistance to streptomycin as a cause of therapeutic failure was first demonstrated by Finland et al (1946) in the treatment of infections of the urinary tract They found that failure of treatment in 8 cases out of 12 was associated with rapid development of resistance to streptomycin by the infecting organisms It is now well known that unless sterilization of the urinary tract is accomplished within 2 or 3 days of the beginning of streptomycin therapy, no beneficial effect can be expected Finland et al also noted that development of resistance was less likely if the urine was kept alkaline

These studies were soon extended to other gram-negative organisms and the Myobacterium tuberculosis Hall and Spink (1947) reported a case of subacute bacterial endocarditis due to B abortus which became resistant during course of streptomycin treatment The strain isolated before commencement of therapy was sensitive to 1 μg/ml of streptomycin, the one isolated on the 29th day of treatment was able to grow in the presence of 7,500 μg/ml

Paine et al (1947) reported the development of streptomycin resistance in one strain each of H influenzæ, Ps æruginosa, and Escherichia coli during treatment of patients suffering from meningitis

The emergence of resistant strains of Myobacterium tuberculosis was reported soon after introduction of streptomycin in the treatment of tuberculosis Resistance to streptomycin was also demonstrated in in-vitro studies and in the experimental infections of animals In the tuberculous guinea pig the emergence of streptomycin-resistance was rare and then after the treatment had been prolonged for several months whilst in the tuberculous mouse or in the human being suffering from tuberculosis, the resistant forms emerged readily

In the tuberculous patient the most important factor in determining the emergence of drug-fast organisms is the duration of treatment. The initial appearance of drug-fast cultures may occur at any time during therapy, but the most frequent time is between the fourth and the eighth week. The degree of resistance manifested by different cultures varies very widely. In some

patients a sensitive culture may be replaced a week later by a highly resistant culture. In others the resistance may increase gradually from week to week In still others after a sensitive culture has become resistant, the resistance may not show further increase in spite of the continuance of streptomycin therapy.

Usually, if a patient completes his course of streptomycin without the emergence of resistant strains, his cultures will continue to remain susceptible to the drug In a few cases, however, resistant strains have been obtained from such patients some time after the last injection of streptomycin has been given.

Variation in resistance also seems to depend upon the site of the disease, the type of lesion and its extent. For example, patients with definite pulmonary cavities produce resistant strains more readily than those without cavitation and those who have high bacillary counts in the sputum at the commencement of therapy show a larger incidence of drug-resistant strains than those who have only few bacilli in the sputum. Also, tubercle bacilli lodged in the C N S develop resistance less readily than do those in the lungs.

Organisms that have become resistant to streptomycin, remain so permanently. They are, however, susceptible to other chemotherapeutic agents such as PAS

The mechanisms of drug resistance is at the time of this writing not clear "Is it merely a selective propagation of streptomycin-resistant variants that are already present in small numbers in any population of organisms, the sensitive individuals being eliminated by virtue of the suppressive action of the antibiotic?" Or is the problem more complicated than this? Alexander and Peidy (1947) reported that resistant variants appeared in cultures of susceptible strains as a result of random mutation which was constantly occurring in the bacterial populations

Be that as it may, the recent publication of the Medical Research Council's investigation into the treatment of pulmonary tuberculosis, has demonstrated beyond the shadow of a doubt that the use of PAS in combination with streptomycin delayed and largely suppressed the emergence of strains of tubercle bacilli resistant to streptomycin. These findings correspond closely to those recently reported from U S A in the comprehensive trials organized by the Veteran's Administration. Hughes (1949 and 50) treated 102 patients with 12 G PAS daily and streptomycin 1 or 2 G every third day, and found that no cases developed streptomycin resistance after 120 days The intermittent administration of streptomycin has been found to be partly responsible for this remarkable result On the other hand, it was shown that the PAS must be given continuously otherwise increasing numbers of resistant strains appear.

Philip Elman (1951) is of opinion that in the treatment of tuberculosis streptomycin should never be used alone, but always in combination with PAS, alternative chemotherapy being with PAS alone

Mode of Action

Even a most superficial examination of the antibiotic spectra of penicillin and streptomycin will show certain differences between the two antibiotics. Penicillin acts against gram-positive bacteria which are not acid-fast. Streptomycin is effective against gram-positive bacteria including those that are acid fast and against gram-negative organisms Penicillin moreover acts against species that are mainly rapidly growing ones, whereas streptomycin is effective against a number of slow growing species such as the myobacterium tuberculosis These differences point to important differences in the mechanism of action of the two agents, *i e.*, in the enzyme systems and/or energy-yielding reactions with which the two antibiotics interfere The mechanism by which streptomycin produces its effect is unknown but there are a number of interesting observations.

When cells of Escherichia coli are suspended for a few hours in broth cultures containing 25 to 50 units of streptomycin per ml. they fail to divide but the individual cells grow into long, filamentous, mycelial forms with numerous swellings scattered or terminal, in various positions along the filament Cells of Escherichia coli suspended in a solution containing high concentrations of penicillin also behave in the same way but there is an important cytochemical difference When penicillin and streptomycin assay plates are seeded with Escherichia coli and stained with a carbolic solution of trypan blue in alcohol and acetic acid and then thoroughly lixiviated with an alcoholic solution of orange G, the blue dye is retained by cells in the outermost regions of the zones of inhibition in the case of penicillin but not in the case of streptomycin plate Trypan blue is used as a specific test for the presence of mononucleotides which accumulate in cells treated with penicillin but not streptomycin. Tests with phenolphthalein show that alkaline phosphatase activity is blocked in cells exposed to streptomycin The failure to detect mononucleotides cannot for this reason be attributed to their having been catabolized to their constituent sugar, base and phosphate All the available evidence (Prat and Dufrenoy 1949) goes to show that streptomycin intervenes in ribonucleic acid metabolism by inhibiting polynucleotidase and blocking a reaction preceding the formation of mononucleotides

Cavallito and his associates (1946) state that the antibacterial action of streptomycin and a number of other antibacterial agents is mediated by their combination with certain thiol groups in isolated chemical systems

Geiger (1947) found that the oxidation of amino acids by Escherichia coli is greatly facilitated by permitting the cells first to act on fumarate or other carbon compounds, and that the increased ability of such E coli to oxidize amino acids is prevented by streptomycin.

Berkman (1948) found that streptomycin interferes with carbohydrate metabolism of resting bacteria

Henry et al (1948) reported that streptomycin produces a partial inhibition of the aerobic oxidation of glycerol.

Barnheim and Fitzgerald (1947) reported that streptomycin prevents the oxidation of benzoic acid by M tuberculosis.

Umbreit and his colleagues (1949) state that streptomycin interferes with the reaction between pyruvate and oxalacetate in cell metabolism.

Pharmacology

Streptomycin, unlike penicillin is not an inert substance However, a number of the pharmacologic actions previously attributed to streptomycin are now known to be due to histamine and other impurities present in the earlier preparations of the antibiotic The pharmacologic actions of pure streptomycin may be summarized as follows .

Cardiovascular Effects—Streptomycin is not cardiotoxic The electrocardiograms taken at frequent intervals during and after injection of normal to very large doses of streptomycin show no significant changes

Large doses of even the pure antibiotic cause a gradual fall of arterial blood pressure from a depression of the vasomotor centre After very large doses (200 to 400 mg per kg body weight) the lowering of the blood pressure is irreversible

Respiratory Effects—Very small doses of pure streptomycin increase both frequency and amplitude of respiration Large doses particularly when injected intravenously cause respiratory depression Acutely toxic doses cause death by respiratory paralysis

Renal and Hepatic Effects—Pure streptomycin is reported by Molitor (1919) to be without renal or hepato-toxic effects

Smooth Muscle—Streptomycin has no significant effect on the isolated uterus and the intestine when it is added to the organ bath

Hematopoietic System—There is no effect

Gastric, Pancreatic and Biliary Secretions—These are not altered by pure specimens of streptomycin

Neurotropic Properties—The most important pharmacodynamic action of streptomycin is its neurotropic action In animals the characteristic effects are a change of gait and posture, ataxia at first of the hind limbs and later on of the fore limbs also, and a progressive loss of the rotational nystagmus. In man there is a difficulty in keeping the eyes focussed on a particular spot Consequently there is difficulty in reading This is attributed to a disturbance in the vestibular apharatus but closely related cerebellar and oculomotor functions may also be involved Ataxia and impairment of hearing may last a long time

Toxicity—The toxic symptoms most commonly encountered after injections of streptomycin have been severe headache, anorexia, nausea, vomiting, abdominal pain, skin rashes, pain in joints, fever and pain at the site of the

injection Skin reactions may be local or generalized. They are usually encountered within 3 weeks of the commencement of treatment and are commonly erythematous or urticarial Maculo-papular and hemorrhagic rashes and even exfoliative dermatitis have been described They are allergic in nature and except for exfoliative dermatitis usually clear up without interdicting the treatment Skin reactions also occur in physicians, nurses and other personnel handling the drug If necessary benadryl or other antihistaminic drugs may be exhibited when they occur Many of the other reactions are due to the presence of the impurities and are less common with the newer and purer preparations of streptomycin

Tinnitus and deafness are definitely less common after introduction of a one-gram daily dose

Dihydrostreptomycin is stated to be less toxic than streptomycin It must not, however, be injected intrathecally as it is very irritating when injected by this route

Absorption - Blood Levels - Excretion

Streptomycin is not inactivated in the gut but it is poorly absorbed After a single intramuscular injection maximum concentration in the blood is reached in 1—2 hours Blood levels of 5 to 7 units per ml are adequate for treatment of urinary infections, various kinds of meningitis and other acute infections not accompanied by bacteremia If bacteremia is present 10 to 15 units per ml has been chosen to distinguish between sensitive and insensitive strains of Myobacterium tuberculosis In man this level may be maintained for 6—8 hours after a single intramuscular injection About 1—2 units per ml are present at the end of 24 hours by which time about 50—80 per cent of the drug is excreted in the urine. Streptomycin permeates various body tissues and fluids and passes the placental barrier. When injected intramuscularly very little diffuses into the C.S. fluid. In acute meningitis, however, diffusion is much greater and effective concentrations can be attained by the usual therapeutic doses The drug does not readily diffuse into the ocular fluids and very large doses are necessary for producing effective concentration in the anterior chamber of the eye The drug penetrates into tissues after local use but corneal penetration is poor. It can be safely injected intrathecally and effective concentrations are maintained up to 48 hours. Dihydrostreptomycin is an irritant and must not be administered by this route.

Dosage and Methods of Administration

Intramuscular Route—Intermittent intramuscular administration is the one most commonly employed for the parenteral use of streptomycin. The solution employed is one which contains 200 mg. of streptomycin in a milliliter of triple distilled water. For all infections other than tuberculosis 0 5 Gm is injected every 6 hours for a period of 7 to 11 days. For tuberculosis the dose is 1—2 Gm. given in one injection on alternate days.

Intrathecal Administration—Intrathecal administration is required in cases of tubercular meningitis and meningitis due to H influenzæ or other susceptible organism The adult dose is 100 mg in 10 ml of physiologic saline on alternate days In children and infants the dose is 50 mg in 5 ml of saline There is no contraindication to the combined use of solutions containing both streptomycin and penicillin intrathecally When such a mixture is intended to be used 10 ml of the saline should contain not more than 100 mg of streptomycin and 10,000 units of penicillin. Dihydrostreptomycin must not be injected intrathecally.

Aerosol Administration—Aerosol administration is indicated in preparation of patients for pulmonary resection and bronchiectasis If it is intended to use both penicillin and streptomycin in the same mixture, the solution is made up with 200 mg of streptomycin hydrochlor and 20,000 units of sodium penicillin per ml Solutions containing streptomycin or both streptomycin and penicillin can be nebulized from a "vaponephrin" type of nebulizer at approximately 1 ml every 10 minutes After short periods of rest the patient again nebulizes the material and many patients can nebulize 2 to 3 ml each hour

Intrathoracic Administration—In the treatment of suppurative intrathoracic disease such as empyema it is sometimes considered desirable to use streptomycin intrapleurally in addition to its parenteral administration Approximately 0 2 to 0 5 Gm of streptomycin is dissolved in 40 ml to 50 ml of physiologic saline and instilled into the pleural space after thoracentesis The treatment is given once every 24—48 hours In the treatment of tubercular empyema this procedure has at times given rise to sharp rises of temperature and other untoward effects.

Intraperitoneal Administration—For prevention and treatment of suppurative conditions in the peritoneum, streptomycin may be used topically either as a solution or 1 Gm of the powder spread about in the peritoneal cavity It may be used alone or in combination with sulfathiazole or penicillin When one decides to use penicillin and streptomycin together the recommended dose is 1,000,000 units of penicillin and 1 Gm. of streptomycin

Oral Administration—When taken orally streptomycin is neither destroyed in the bowel nor absorbed into the circulation It has for this reason been employed orally in the treatment of infantile gastroenteritis and before operations on the bowel It is not necessary to give streptomycin for more than 2 or 3 days before the operation The recommended oral dose is 0 5 Gm every 6 hours Streptomagma (Wyeth), is a colloidal gel suspension containing in each fluid ounce 4 63 gr. of dihydrostreptomycin sulphate, 45 gr of kaolin, and 4 gr. of pectin. It combines all the requisites essential for the prompt and complete clinical remission of infectious bacterial diarrheas

Local Application—Topical applications in solution or ointment are used in the treatment of wounds, burns and sinuses Solutions of streptomycin containing 10 mg to a ml can be used safely even in the conjunctival sac.

Clinical Indications

Streptomycin is a valuable antibiotic in the therapy of tuberculosis and *many other conditions Its indications are well summarized in the following* table from Chester S Keefer :

TABLE 8. DISEASES IN WHICH STREPTOMYCIN IS INDICATED

Abscesses due to mixed bacterial infections :

Appendiceal abscess	Retroperitoneal abscess
Liver abscess	Subphrenic abscess
Perirectal abscess	Subhepatic abscess
Pelvic abscess	Tubo-ovarian abscess

Bacteremias

A aerogenes	Pr vulgaris
E. coli	Ps. aeruginosa
Kl pneumoniæ	Salmonella
H influenzæ	Penicillin-resistant, streptomycin-sensitive, gram-positive bacteria

Bone and joint infections due to gram-negative bacilli.

Brucellosis—Best results have been obtained in acute cases when used combination with aureomycin.

Endocarditis due to gram-negative organisms and penicillin-resistant streptomycin-sensitive organisms

Infections of the gastro-intestinal and biliary tracts :

Cholangitis	Diverticulitis
Acute cholecystitis	Ulcerative colitis
Pylephlebitis	

Genito-urinary tract infections other than pyelonephritis :

Prostatitis	Seminovesiculitis
Epididymitis	

Granuloma venereum

Meningitis

H influenzæ	P. tularensis
E. coli	Other gram-negative organisms
Ps æruginosa	

Ophthalmic infections :

Conjunctivitis and corneal ulcers
Ps. æruginosa
B. coli

Peritonitis due to single gram-negative organisms or mixed infections

Postabortal and puerperal sepsis

Prophylactic use prior to surgical treatment of gastro-intestinal tract lesions

Respiratory tract.

Pneumonia due to gram-negative organisms

H influenzæ
H pertussis
Kl pneumoniæ

Empyema due to gram-negative bacilli

Lung abscess with mixed infection

Ozena and scleroma

Laryngotracheobronchitis

Infections of epiglottis

Salmonella infections

Infections of skin and subcutaneous tissues

Tularemia

Tuberculosis

Chloromycetin

Chloromycetin or chloramphenicol is derived from streptomyces venezuelæ The production involves growing the seed spores successively in 50 gallon "pre-seed" tanks, then in 500 gallon seed-tanks and finally in 5,000 gallon fermentation tanks The nutrient medium consists of wheat gluten, glycerin, sodium carbonate and sodium chloride, and biosynthesis occurs under aerobic conditions The antibiotic has also been prepared synthetically (Bartz 1948)

Assay—Choloromycetin may be assayed by turbidimetric measurements of standard broth cultures seeded with shigella paradysenteriæ The potency of crude liquor or partially purified chloromycetin is expressed in terms of the concentration of the crystalline compound (0 2 microgram per ml), required to cause 50 per cent. inhibition. Alternatively, the activity can be tested in terms of the concentration of the antibiotic required to prevent development of rickettsial organisms inoculated into eggs.

Mode of Action—Smith and his associates (1949) have studied the action of chloromycetin on enzyme systems After studying nearly 45 enzyme systems they came to the conclusion that the antibiotic does not inhibit cellular respiration of either resting or actively growing bacteria. The utilization of

carbohydrates was not blocked. Nor was protein break down influenced. Bacterial esterases were, however, found to be inhibited. On the basis of these studies they suggest that the inhibitory effects of chloromycetin on the esterase system present in bacteria may be concerned in the mechanism of its antibiotic effects In support of their suggestion they found a remarkable agreement between the effects of various concentrations of chloramphenicol on the growth and esterase activity of E coli. In therapeutic concentrations chloramphenicol produced a markedly inhibitory effect of both growth and esterase activity.

A remarkable antagonism in-vitro has been found to exist between the actions of chloromycetin and penicillin when the two antibiotics are used together

Pharmacology—Like penicillin, chloromycetin is pharmacologically inert. It has no effect on the C N S, respiration or cardiovascular systems

Absorption - Distribution - Excretion—Chloramphenicol is rapidly absorbed when administered orally. Maximum concentrations in the blood occur approximately 2 hours after administration of the drug and are proportional to the size of the dose After an oral dose of 3 G. the peak blood level of 45 µg/ml. is reached in 2 hours The blood level declines gradually and a minimum effective level (10 µg/ml) is attained after 10 hours.

Chloramphenicol is rapidly degraded in the body to inactive nitro-compounds and small amounts of aryl amines in which shape 90 per cent of the ingested drug is excreted in the urine by the tubules. Approximately 10 per cent. of chloramphenicol is excreted by the glomeruli as such

The distribution of chloramphenicol in tissues is not uniform The highest concentrations are reached in the liver and kidneys and the lowest in the brain and spinal cord In man within 3 hours of an average dose, chloramphenicol can be demonstrated in the spinal fluid in a range of 4 to 12 µg./ml. Chloramphenicol passes the placental barrier and appears in the fetal circulation

Toxicity—The drug is of very low toxicity. The most frequent side effects are nausea, vomiting, a mild diarrhea and allergic skin reactions Diarrhea is less common than with aureomycin or terramycin. Dryness of the mouth, stomatitis and a persistent bitter taste have been reported

Therapeutic Uses—Chloramphenicol is the drug of first choice in the treatment of S typhi and the salmonella group. It shares the first honour with aureomycin and terramycin in the treatment of shigella dysenteriæ group and the rickettsia group In view of the greater range of its therapeutic efficiency Cohen and Shertz (1950) consider it as the agent of choice in acute respiratory infections of undetermined origin in the absence of an influenza epidemic or a common cold. It has been found effective in the treatment of gram-negative urinary infections, brucellosis, pertussis, mumps, secondary complications of measles, herpes zoster, infectious mononucleosis, chronic prostatitis, acute or recurring epididymitis, lymphopathia venereum, granuloma inguinale, surgical infections, H. influenzæ meningitis, ulcerative colitis, gonorrhea, syphilis,

psittacosis and tularemia The dose recommended is 50 mg /kg body weight daily, when the afebrile period is reached, half this dose daily may suffice It is marketed as capsules (250 mg) for oral use, as chloromycetin palmitate pediatric in a custard flavoured suspension (a teaspoon containing 125 mg. chloromycetin), and recently as chloromycetin parenteral.

Aureomycin

Aureomycin is the yellow antibiotic biosynthesized by the actinomycete, streptomyces aureofaciens, which was discovered by Duggar (1948)

Aureomycin and its salts appear to be stable for many months at room temperature when dry. In neutral or alkaline solutions it deteriorates rapidly even at room temperature

Production—Several mutant strains of streptomyces aureofaciens have been produced by irradiation. One of these designated A-377, has been selected as giving high yields of the antibiotic in either surface or submerged cultures.

Assay—Serum, whole blood and biologic fluids inactivate aureomycin in in-vitro tests This factor is of importance in performing assays to determine aureomycin blood levels. Assay is done by the cylinder plate method or the serial dilution method with the bacillus subtilis as test organism

Mode of Action—The mode of action of aureomycin is at the present time not known. The drug is bacteriostatic. Loomis (1950) suggests that the ability of aureomycin to inhibit aerobic phosphorylation may be concerned with its antibiotic action

Absorption - Diffusion - Excretion—When ingested orally the drug passes readily into the circulation When doses of 0 5 to 1 0 Gm are administered orally every 6 to 8 hours effective serum drug levels of 2-4 μg /ml are maintained In some patients the levels may exceed 6 or even 8 μg /ml The drug is concentrated in the tissues, bile and urine in higher concentrations than in the serum when given repeatedly in therapeutic doses It readily passes into the pleural and C S fluids and the concentration attained in these is half that in the blood It also traverses the placenta and may be of value in prenatal syphilis. Aureomycin persists for a relatively long period in the body fluids and is slowly excreted in the urine and the bile.

It should not be administered together with antacids as these drugs inhibit the absorption from the intestines of aureomycin

Toxicity—Aureomycin is practically non-toxic The intravenous LD_{50} in mice is 131 gm per kg The oral administration to mice or dogs of 100 mg per kg daily over many weeks produced no gross or microscopic changes in the important viscera In human beings no serious toxic effects follow single or repeated oral doses The most frequent side effects are a metallic taste, epigastric distress, nausea, vomiting and frequent loose and bulky stools Sometimes patients complain of a bizarre desire for certain types of food, voracious appetite, anorexia, stomatitis, cheilosis, mucous membrane eruptions and

vaginitis. Herxheimer type of reaction has been observed in patients of brucellosis and syphilis treated with aureomycin. Vertigo and euphoria are sometimes encountered Rectal burning and reactions such as drug fever and skin reactions occur but are extremely rare

When aureomycin is given orally over long periods intestinal synthesis of vitamins is interfered with

Antibiotic Spectrum—Aureomycin has a wide antibiotic spectrum which includes gram-positive and gram-negative organisms, rickettsias, viruses and spirochetes It is active also against endemeba histolytica. In-vitro, aureomycin is, in general, less effective than penicillin against the gram-positive cocci with the single exception of *streptococcus fecalis, an organism* concerned in the etiology of bacterial endocarditis and urinary tract infection. Chandler and Bliss (1918) found six strains of streptococcus fecalis which were more sensitive to aureomycin than penicillin Aureomycin while active against myobacterium tuberculosis *in-vitro*, has *no value in the treatment of human tuberculosis*

Therapeutic Uses—Aureomycin is the drug of choice in the treatment of infections due to staphylococcus aureus, hemophillus ducreyi (chancroid) E. coli, aerobactor aerogenes, borrelia recurrentis, leptospira icterohemorrhagica, psittacosis virus, lymphopathia venereum, primary atypical pneumonia and granuloma inguinale It shares the first place with chloromycetin and terramycin in the treatment of shigellosis (bacillary dysentery) and rickettsial diseases, and with terramycin in the treatment of brucellosis Combined with streptomycin it is probably the most effective drug in the latter condition. Aureomycin is effective in a large number of other conditions: subacute bacterial endocarditis, pneumococcal pneumonia, gonorrhea, H. influenzæ meningitis, whooping cough, tularemia, gram-negative urinary infections, primary and secondary syphilis, yaws, ulcerative colitis, amebic dysentery, burns, molluscum contagiosum, mumps, infectious mononucleosis, herpes zoster, and radiation sickness The dose is 0 5 Gm. every 6 hours by mouth. The antibiotic may be used topically for infections of the eye, mucous membranes and skin and is available in the form of solution, powder, ointment, ophthalmic ointment, dental cones and troches.

Terramycin

Terramycin is derived from cultures of the soil actinomycete streptomyces rimosus It is a broa spectrum antibiotic effective against infections due to a large variety of bacteria, spirochetes, rickettsiæ and large viruses.

Mode of Action—Terramycin possesses largely a bacteriostatic rather than a bactericidal action. Its antibiotic spectrum is very similar to that of aureomycin. A spectrohemometric analysis shows many points of similarity in the molecular structures of the two antibiotics. In view of these similarities it is possible that the two antibiotics may be effective through the same mechanism, *viz.*, by inhibition of aerobic phosphorylation.

Absorption - Distribution - Excretion—Terramycin is readily absorbed when taken by mouth or administered parenterally Effective blood levels of 0 5 to 1 0 μg of terramycin can be attained on a daily dosage of 2 to 3 Gm given in 6-hourly divided doses If the individual doses are increased above 1 Gm there is no corresponding increase in the blood levels This is due to the fact that as the blood concentration reaches a certain level no more absorption takes place from the intestine and the drug is excreted in the feces When effective blood concentrations are present the drug diffuses into the pleural fluid Appearance in the C. S fluid is delayed and irregular It traverses the placental barrier and is present in the fetal circulation Terramycin is excreted chiefly in the urine Significant amounts appear in feces and bile

Toxicity—It is a relatively non-toxic antibiotic as shown by studies in experimental animals and man The only untoward side effects are nausea, vomiting, diarrhea, stomatitis and skin reactions.

Therapeutic Uses—It is a broad spectrum antibiotic and shares the first place with penicillin in the treatment of pneumococcal pneumonia, with chloramphenicol and aureomycin in the treatment of bacillary dysentery and the rickettsial group, and with aureomycin cum streptomycin in the treatment of brucellosis The correct place of terramycin in these and other disease conditions as compared with chloramphenicol and aureomoycin will be determined after future clinical trials

The drug has been found to be extremely effective in the treatment of pneumonia of unknown etiology It has been recommended in the treatment of acute streptococcal infections, but penicillin is superior It is recommended for the treatment of acute staphylococcal infections but penicillin and aureomycin are more effective. The drug like aureomycin and chloramphenicol is effective in the treatment of syphilis and gonorrhea It is also effective in the treatment of lymphopathia venereum and chancroid but aureomycin appears to be better. Terramycin is useful in the control of intestinal amebiasis, bacillary infections including anthrax, hemophilus, klebsiella, ærobactor ærogenes, escherichia coli and pasturella. The drug has been found ineffective in the treatment of urinary infections due to Ps æruginosa and B proteus

Polymyxins

Polymyxins D, A, B, C and E are derived from B polymyxa and are basic polypeptides They are incompletely absorbed from the gastrointestinal tract but therapeutic blood levels (0 2 μg/ml) are readily attained by parenteral administration. As with other polypeptide antibiotics, the toxicity of polymyxins has seriously limited their use In doses exceeding 2 5 mg/kg signs of nephrotoxicity appear. The renal abnormalities disappear 3—4 days after discontinuation of the drug

The polymyxins have a narrow spectrum and are especially effective against gram-negative bacteria. In in-vitro tests the polymyxins A, B and D are equally active against ærobactor ærogenes, brucella, eberthella, escherichia, hemophilus, pasturella, pseudomonas, salmonella, shigella, vibrio and

some strains of neisseria and proteus. Polymyxin A has been used parenterally in the treatment of pertussis with encouraging results in the early cases Polymyxin B produced good therapeutic response in acute pseudomonas urinary infection and in a case of hemophilus influenzæ meningitis. Polymyxins B and E are stated to be less nephrotoxic than polymyxins A and D.

Drilitol (Smith, Kline and French Laboratories), is a combination of gramicidin 0 005 per cent, polymyxin B sulfate 500 units per c.c, thenylpyramine hydrobromide 0 2 per cent, hydroxyamphetamine hydrobromide 1 per cent and preserved with thiomersol 1 : 100,000 This combination is recommended for prophylaxis and treatment of a wide range of common upper *respiratory tract disorders, including the common cold and its sequelæ, sinusitis,* nasopharyngitis, allergic rhinitis, etc It contains two antibiotics, an antihistaminic and an effective vasoconstrictor.

Tyrothricin

Tyrothricin is a mixture of polypeptides prepared by Dubos (1939) from the culture filtrates of B brevis. The antibiotic activity is due to the presence of two cyclic polypeptides, gramicidin and tyrocidin. The former is the more active of the two especially against gram-positive organisms; the latter has a limited activity against gram-negative organisms Tyrothricin is hemolytic both in-vitro and in-vivo and cannot be administered parenterally. Its therapeutic value is limited to its topical use in the treatment of superficial indolent ulcers, infected wounds, mastoiditis, empyema, acute sinusitis, osteomyelitis and *ophthalmic infections* A 0 5 *mg. per c c solution in normal saline* is employed Even topically used it is not always without risk and its indiscriminate use in the nose may lead to irreversible damage to the olfactory nerve.

Bacitracin

Derived from culture filtrate of a strain of B subtilis, it resembles penicillin in its antibiotic spectrum The drug is nephrotoxic and cannot be given parenterally. Its chief use is for topical therapy of surgical infections A true synergism between penicillin and bacitracin has been reported

Neomycin

Neomycin was isolated by Waksman and Lechevalier (1949) from S. fradiæ. A clinical appraisal by Waisbren and Spink (1951) showed that the drug has no value in the treatment of tuberculosis It eradicated P. vulgaris from the urine in 16 out of 17 cases and P. æruginosa in 8 out of 11. The antibiotic is

Viomycin

Viomycin is derived from streptomyces puniceus and streptomyces floridæ. All workers are agreed that it is active against streptomycin-sensitive and streptomycin-resistant strains of the tubercle bacillus and inhibits them in concentrations of 0·78 to 12 5 μg of viomycin per ml. Werner et al (1951) *employed the drug in 10 cases with slight to moderate improvement in five*

The drug is very toxic and side effects include anorexia, nausea, lassitude, muscle cramps and paresthesiæ Nine patients developed albuminuria with casts. In two there was disturbance of vestibular function and partial deafness

Mycomycin

Mycomycin is produced by a mold-like actinomycete and is active against a variety of gram-positive and gram-negative bacteria, myobacteria and also some yeasts and fungi It has low toxicity for mice and has been found effective in mice tuberculosis The drug is however, extremely unstable and so far it has not been possible to prepare it in the dry state

Lupulon

The search for ideal drug in the treatment of tuberculosis continues Lupulon, a new antibiotic derived from the soft resins of hops, humulus lupulus, has been shown to have some effect in this disease

The drug is administered orally in doses of 1 Gm every 6 hours Clinical improvement has been manifest in some of the cases treated, the cough diminished in intensity and frequency and the daily volume of sputum showed a decrease Three out of ten patients developed a negative sputum after therapy No signs of toxicity to liver, kidney, bone marrow or myocardium were observed.

Although these investigations are only of preliminary nature and no definite conclusion can be drawn from them, the results obtained are sufficiently encouraging to lead to further studies

Fumagillin

Fumagallin is an antibiotic isolated from a species of aspergillus It has no action against bacteria, fungi or viruses. It is, however, effective in-vitro and in the experimental animals against endameba histolytica In young rats and rabbits infected with E histolytica excellent results were obtained

SULPHONAMIDES

HISTORICAL

In the year 1908 Gelmo synthesized para-aminobenzene sulphonamide, now known as sulfanilamide but its therapeutic value was at the time neither suspected nor investigated In 1909 Horlein, Dressel and Kothe prepared azo dyes with sulfonamide and substituted sulfonamide groups One of the compounds they prepared possessed a limited therapeutic value in hemolytic sreptococcic infections of mice This work, however, received little attention In 1932 investigation under Domagk resulted in the production of 4 sulfamide 2 4, diaminoazobenzene, a brick-red powder, relatively insoluble in water to which the trade name "Prontosil" was given In 1933 Foerster under the name of "streptozon" employed it in the first recorded human instance, that of a child suffering from a staphylococcal septicemia; recovery ensured The name used by Foerster was due to his knowledge of the fact that Domagk had used the drug in 1932 in the experimental infections of mice with hemolytic streptococci In 1935 Domagk published his epoch making paper announcing to the world the remarkable effectiveness of the original prontosil in experimental streptococcic infections of mice and rabbits This constituted one of the greatest discoveries in the history of modern chemotherapy Later in the same year Domagk introduced the disodium salt of 4 sulfamidophenyl 2-azo-7 acetyl amine 1 hydroxynaphthalene-3, 6 disulfonate, called Prontosil S or Prontosil soluble This compound was marketed under the name of neoprontosil in tablets and in a 5 per cent solution In 1935 Trefouels et al found that azo dyes broke down in the tissues to para-aminobenzene sulfonamide, the compound first synthesized by Gelmo 32 years ago, and suggested that the therapeutic action of the original and soluble prontosil was due to this substance called prontosil album and later sulfanilamide Domagk, however, claims for prontosil rubrum characteristic and superior properties associated with azo dye linkage and not due solely to its liberation of sulfanilamide in the system This view not shared by the majority of workers, is somewhat supported by the finding that weight for weight prontosil rubrum is more active than sulfanilamide and that sulfones chemically unrelated to sulfonamide have similar bactericidal properties. During the last 15 years hundreds of compounds based on sulfonamide grouping have been subjected to extensive experimental and clinical tests Out of these only a few are employed in clinical medicine at the present time These are ·

Sulfanilamide
Sulfapyridine
Sulfathiazole
Sulfadiazine
Sulfamethazine
Sulfapyrazine
Sulfaguanidine

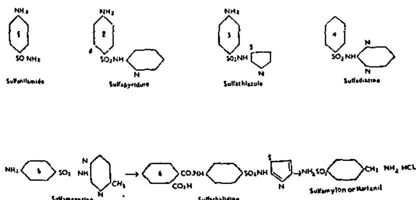
Sulfasuxidine
Sulfathalidine
Sulfamylon

Sulfanilamide no longer is widely used, having retired, as it were, to its richly deserved high pedestal, from which the remarkable achievements of its progeny can be surveyed. Likewise, the first important offspring, sulfapyridine has been relegated to medical history by its less toxic and more versatile descendents,—sulfathiazole and sulfadiazine (with the latter gaining ascendency) which now stand in position to be challenged by all new compounds of this series. Certain sulfonamide derivatives, notably sulfaguanidine, sulfasuxidine and sulfathalidine have been introduced for specific therapeutic jobs based upon peculiar chemical properties; the fact that they are poorly absorbed from the intestinal tract permits selective therapy for intestinal infections with little danger of systemic toxicity. Sulfamethazine and sulfapyrazine have no advantages over sulfadiazine; they are no less toxic and no more potent.

CHEMISTRY

Sulfanilamide is a synthetic derivative of aniline which is formed by the addition first of a sulfonic acid group and then of an amido group. All of the compounds in common usage are closely related to sulfanilamide. Sulfapyridine is formed by the substitution of a pyridine group for one of the hydrogens of the amino group. Likewise sulfathiazole is formed by the substitution of a thiazole radicle at the same point, and sulfadiazine can be similarly synthesized by the addition of pyrimidine at this point.

The chemical relationship is shown in the structural formulae.



MODE OF ACTION

Numerous theories have been advanced to explain the mode of action of the sulfonamide group of drugs. The one that is at present held is that para-amino-benzoic acid is an essential growth substance of many bacteria and is

probably synthesized by the bacterial cell, and Woods has suggested that in the enzyme reaction necessary for the utilization of para-amino-benzoic acid by the cell, para-amino-benzene sulfonamide offers competition for a position in this reaction because of the similarity between the chemical structure of the two compounds. If sufficient sulfanilamide is present to displace para-amino-benzoic acid from the enzymic reaction, the growth of the bacterial cell is inhibited. If, however, an excess of para-amino-benzoic acid is present sulfanilamide is displaced and growth is unimpeded This is of practical importance The bacteriostatic action of sulfonamides is inhibited in the presence of protein break-down products, including peptone and pus.

It has been suggested by Cokinis that sulfonamides do not help development of immunity, so that when the treatment is stopped there is just the possibility of a relapse Moreover, by stopping the activity of the infective organisms they may hinder formation of immunity in the body thus leaving the patient with a latent infection without the means to combat it.

ABSORPTION AND EXCRETION

Reinhold, Flippin and Schwartz (1940) gave oral single doses of 3 Gm of sulfathiazole, sulfadiazine and sulfamerazine to human subjects and then determined the free and total blood levels of these drugs at intervals of one, two, four, six, eight and twenty-four hours after the dose Sulfathiazole was found to be absorbed more rapidly and also excreted more rapidly than sulfadiazine Sulfamerazine was absorbed more rapidly and excreted more slowly than either sulfathiazole or sulfadiazine. This serves to explain why the maintenance dose of sulfamerazine may be as low as 1 Gm every 6 to 8 hours With an initial dosage of 3 Gm and 1 Gm 4 hourly, there was an average concentration of 5 mg of free sulfathiazole per 100 c.c of blood with individual concentration from 1 2 to 19 mg per 100 c c With a similar schedule for sulfadiazine the average concentration was 9.5 mg per 100 c c. and the range of concentration between 4 4 to 19 mg With sulfamerazine on a dose of only 4 Gm in 24 hours, the average concentration attained was 9.8 mg and with 1 Gm every 8 hours the concentration was only slightly less, *viz*, 7 mg per 100 c c.

When single oral doses of sulfathiazole were given, excretion in the urine during the first 24 hours accounted for 60 to 93 per cent of the ingested drug. After a similar dose of sulfadiazine excretion was less than 50 per cent in the first 24 hours In 48 hours 47 to 85 per cent was excreted For the same dose of sulfamerazine an average 40 1 per cent of the ingested drug was found in the urine during 24 hours, while after 48 hours only 53 5 per cent had been thus excreted

Long and Biss (1939) following oral administration of single doses of sulfapyridine found that urinary excretion was not complete until three or four days had elapsed Then, instead of finding 85 to 95 per cent of the drug in the urine, as would have been the case with sulfanilamide, the amount of sulfapyridine in the urine varied from 39 to 71 per cent of the amount ingested. This indicates a relatively complete absorption of sulfanilamide and an incomplete absorption of sulfapyridine.

Acetylation of all five of these drugs takes place probably in the liver. It is believed that the acetylated drug is inactive The acetylated forms of sulfapyridine and sulfathiazole are less soluble than the corresponding free drugs In the case of sulfadiazine and sulfamerazine, the acetylated forms are more soluble A high percentage of the sulfapyridine that appears in the urine is acetylated Sulfathiazole and sulfadiazine are acetylated to a much lesser degree Approximately 25 per cent of the urinary sulfadiazine is acetylated, although there are wide individual differences An average of about 50 per cent of excreted sulfamerazine was found to be acetylated with figures varying from 16 to 72 per cent

Sulfaguanidine and sulfasuxidine are very poorly absorbed and therefore remain in the colon to exert their bacteriostatic effect there Owing to very slow absorption, only about 5 per cent or less of the total dose of sulphasuxidine is excreted in the urine.

DIFFUSION

Diffusion of sulfonamides in the body is so readily accomplished that its concentration in various body tissues and fluids is approximately equal According to Marshall it is present in saliva, pancreatic juice, bile, exudates and transudates in a concentration slightly lower than in blood and readily passes into the cerebro-spinal fluid It passes from the maternal to the fetal circulation in pregnant animals and women and is present in same concentration in the maternal and the fetal blood It has produced abortion in rabbits and should be given with care during pregnancy It has been found in human milk in same concentration as in the blood but with apparently no toxic results on nursing infants

DOSAGE AND ADMINISTRATION

The following conclusions with regard to dosage and administration are based, on the rate of elimination and absorption, on the concentration of the free drug, required in the blood for therapeutic effectiveness and on the results of treatment in experimental animals and human beings

1. Treatment should be commenced as early as possible and preferably after a bacteriological as well as a clinical diagnosis has been made

2. The initial dose should be large particularly in severe or moderately severe infections in order to produce an effective concentration of the free drug in the blood as soon as possible to avoid sulfonamide fastness

3. The selected compound should be given by mouth when possible. When intense nausea and vomiting or the patient's condition make oral administration difficult, it may be given parenterally In comatose patients or those who cannot swallow, it is possible to give the drug through a nasal tube placed in the stomach. For parenteral use the preparations at present most frequently used are sodium salts of sulfathiazole, and sulfadiazine Sodium sulfamerazine is also available for this purpose In certain instances, when a rapid elevation of blood level is desired the drug may be given parenterally to supplement oral therapy A sulfathiazole—sulfadiazine combination (equal parts) is more effective than the same total concentration of either drug alone.

indicating true potentiation. The combination is also attended by less risk of crystalluria.

4. The drug should be given at intervals of 4 to 6 hours both during day and night for several days until improvement occurs. The night doses are important and should not be neglected. The total daily dose is then reduced or the intervals of administration lengthened, but treatment should be continued if possible until convalescence is well established and cultures are negative to prevent recrudescence of infection.

5. The concentration of free sulfonamides varies considerably in different persons. It is, therefore, necessary to perform tests for concentration at frequent intervals and vary the dosage accordingly.

6. When no response is obtained from use of the compound first selected, it is preferable to switch over to a different compound.

7. When pus is present it must be drained.

8. During the administration of sulfonamides, fluids should be given in large quantities.

9. Alkalies (sodium bicarbonate) should also be given at the same time. A suitable proportion is equal parts of sulfonamide and sodium bicarbonate for each dose.

The following table gives the rough dosage of the commonly used preparations:

Dosage of Principal Sulfonamides

Compound	Initial dose	Intervals	Subsequent doses	Total in 24 hours	Remarks
Sulfanilamide	3 Gm	4-6 hours	1 Gm.	8 Gm.	Rarely used now.
Sulfapyridine .	3 Gm	4-6 hours	1 Gm	8 Gm	Gives rise to intense nausea and vomiting, is more toxic and rarely used now
Sulfathiazole	3 Gm	4-6 hours	1 Gm	8 Gm.	Preparation of choice in gonorrhea urinary infections and staphylococcic infections.
Sulfadiazine	3 Gm	4-6 hours	1 Gm	8 Gm	Preparation of choice in meningitis of all kinds and puerperal sepsis
Sulfamerazine .	3 Gm	6-8 hours	1 Gm.	5 Gm	Preparation of choice in pneumococcic infections and streptococcal infections of throat
Sulfaguanidine ..	4 Gm	4 hours	3 Gm	18 Gm.	Useful in bacillary dysentery and diarrhoeic conditions; in author's opinion inferior to sulfadiazine.
Sulfasuxidine .	4 Gm	4 hours	3 Gm	18 Gm.	Useful in bowel affections and surgery of the bowel
Sulfathalidine .	1.5 Gm	4 hours	1.5 Gm	9 Gm	Do.

STREPTOCOCCAL INFECTIONS

Streptococcal disease in human beings may assume diverse forms, puerperal fever, septicemia, cellulitis, erysipelas, pneumonia, meningitis, peritonitis, genito-urinary infection, scarlet fever, subacute bacterial endocarditis and several others, and the response to therapy with sulfonamides in different manifestations is not the same. Infections with virulent hemolytic strains such as the beta-hemolytic type are more responsive than those with streptococcus mitior. Infections with anaerobic hemolytic streptococci of mice are much less susceptible to the therapeutic activity of sulfonamides than infections with aerobic strains and since temporary or permanently anaerobic hemolytic streptococci may be found in a large percentage of hemolytic streptococcic infections in human beings, this may offer an explanation of the failure of these drugs in treatment of some cases of puerperal sepsis and other hemolytic streptococcic infections Another factor to be borne in mind is that there are at least three factors involved in the pathogenic action of the more virulent streptococci, the invasive factor, the hemolytic factor and the erythrogenic factor. It is in infections in which the invasive factor (or the one concerned in tissue destruction, pus formation or septicemia) is predominant that therapeutic benefit is most marked

Puerperal Sepsis

Puerperal sepsis is usually caused by beta-hemolytic streptococci Rarely it may be due to staphylococci, colon bacilli, pneumococci, gas bacilli, typhoid bacilli and other rarer organisms. The treatment with sulfanilamide and other sulfonamides has been extremely successful Brown (1943) suggests sulfanilamide if the fever is due to beta-hemolytic streptococcus If cultures reveal staphylococcus or B. coli, sulfathiazole is preferred Sinykin (1943) advises sulfadiazine as the drug of choice in almost all obstetric infections because it is more pleasant to take and makes possible the maintenance of the desired blood level with less frequent doses

Scarlet Fever

In case of scarlet fever sulfanilamide has not materially shortened the duration of fever or shown any marked effects on the rash This is due to the fact that the drug has but feeble neutralizing or inactivating power on the erythrotoxin of this disease. In the presence of complications such as infections of the blood stream or meninges, the drug has definite value Watson et al (1943) used sulfadiazine for prophylaxis in an epidemic of scarlet fever at a naval station, their results are highly encouraging. Hall and Spink (1943) treated 4 patients with scarlet fever with sulfamerazine The skin rash diminished within 12 to 24 hours and the patients felt subjectively better. No complications occurred.

Erysipelas

Snod, Gross and Anderson (1937) compared 106 cases of erysipelas treated with sulfanilamide with a control group in which the ultra-violet radiation was used. In 76 per cent of the drug treated patients the temperature was normal within 48 hours while only 48 per cent of the ultra-violet group had this result.

Recurrences, complications and deaths were all significantly less with sulfanilamide therapy.

Myer-Heine and Huguenin (1936) studied 150 cases treated with approximately 2 Gm. of sulfanilamide daily and regard the drug as a specific therapeutic agent. In 98 5 per cent of their cases the course was one of rapid fall in temperature with subsidence of the local lesion within 48 hours; there were no deaths and few local complications

Nelson Rinzler and Kelsey (1939) compared results in 344 sulfanilamide treated cases with the results for over 4,000 other cases in which various other therapies had been applied They found the duration of fever to be shortened from 6.8 to 4.2 days, the mortality from 8 to 1.9 per cent and the hospital stay from 11 to 6.9 days The 382 adults treated with erysipelas antitoxin in their series had a mortality rate of 9 2 per cent, an average stay of 11 1 days and febrile period of 6 8 days

Foley and Yasma (1940) compare the results of 80 cases in which sulfanilamide was not used with 80 controls in which sulfanilamide was used. It was found that the drug treated patients returned to a normal temperature almost 2 days earlier than the controls, the hospital stay was shortened three days and the complications were half as few for the sulfanilamide treated patients. The mortality rate in the sulfanilamide series was one-fourth that of the control group

Subacute Bacterial Endocarditis

Sulfanilamide is of no value in the treatment of this disease. A few cures have been reported by Kelson and White (1939) with the use of sulfapyridine and Stirling (1940) with the use of sulfathiazole But the results are on the whole disappointing and although some cases may respond for a time recurrences soon occur as soon as the sulfonamide is stopped The penicillin treatment of subacute bacterial endocarditis is very effective and has been described earlier

Meningitis

One of the most impressive results observed with sulfonamides has been in the treatment of streptococcic meningitis, with which the mortality in the pre-sulfonamide era has been almost 100 per cent.

The drug of choice seems to be sulfadiazine. It is preferable to give the drug orally but in comatose patients parenteral route may be used

Tonsillitis Pharyngitis Laryngitis Cervical Adenitis

The drug of choice according to Hall and Spink is sulfamerazine but when this is not available other sulfonamides may be given The initial dose is 3 Gm. followed by 1 Gm every 8 hours

STAPHYLOCOCCAL INFECTIONS

Treatment of staphylococcal infection with sulfanilamide or even sulfapyridine is of doubtful value. Numerous successful reports have been

published from the use of sulfathiazole and sulfadiazine Fitch (1939) successfully treated with sulfathiazole a child who had staphylococcic septicemia and pyemia Stirling (1940) used it effectively in the treatment of an elderly person with staphylococcic septicemia Melton (1940) treated six cases of osteomyelitis and five cases of carbuncle of the face, with sulfathiazole with encouraging results Hambruger (1941) treated 12 cases of septicemia with sulfathiazole with recovery in 8. Spink et al (1941) treated 15 cases with staphylococcic bacteremia with sulfathiazole with sterilization of the blood in all. Perrin H Long (1941) reported that in experimental staphylococcic infection sulfadiazine was equal, if not slightly superior to sulfathiazole

It is apparent from the foregoing that sulfathiazole and sulfadiazine are of great value in the treatment of patients with staphylococcemia It should be emphasized, however, that although sulfathiazole and sulfadiazine will sterilize the blood stream viable organisms will persist in localised abscesses and metastatic lesions Therefore, as an adjunct to therapy with a suitable sulfonamide it is imperative that abscessed areas be adequately drained.

Sulfathiazole and sulfadiazine are also useful in recurrent boils, large boils and carbuncles, diffuse cellulitis, lymphangitis, and acute and chronic osteomyelitis.

PNEUMOCOCCAL INFECTIONS

Pneumonia

The drug of choice at present in the treatment of pneumococcal pneumonia is sulfamerazine A close second is sulfadiazine The mortality rate in cases treated with sulfapyridine (M & B 693) is 13 1 per cent It is 10 9 per cent for sulfathiazole, 10 7 per cent for sulfadiazine and only 7 5 per cent for sulfamerazine In addition the great advantage of sulfamerazine is that higher concentrations in blood are attained with smaller and infrequent doses The initial dose of 3 Gm. is followed by 1 Gm every 8 hours As with other sulfonamides fluids should be forced. The best route is oral, but in those who cannot swallow, parenteral therapy with sodium sulfamerazine is indicated

Meningitis

The sulfonamide of choice appears to be sulfadiazine Sulfapyridine (M. & B 693) is a good second

GONOCOCCIC INFECTIONS

The sulfonamide of choice is sulfathiazole It should be given combined with an equal amount of sodium bicarbonate The dosage recommended is 3 Gm at once, followed by 1 Gm in 4 hours and 1 Gm every 6 hours day and night Most cases respond to this dosage schedule A rare case that does not respond should be treated with combined sulfonamide and fever therapy or combined sulfonamide and penicillin therapy.

Cases that continue to pass threads in the urine, need prostatic massage twice weekly in addition to treatment with penicillin or sulfonamides.

Gonorrhea in the female and gonococcal vulvovaginitis in girls also respond to treatment with sulfathiazole or penicillin or a combination of the two

Gonorrheal arthritis and gonorrheal ophthalmia have also been successfully treated with sulfathiazole. Culp (1940) treated 22 cases with very encouraging results.

Arthur and Dermon (1943) suggested that sulfathiazole was a valuable agent in prophylaxis of gonorrhea when the routine prophylaxis had been delayed or omitted after sexual exposure. Preventive therapy should be instituted on the following morning and consists of 3 Gm. of the drug after breakfast, 2 Gm after lunch and 1 Gm after dinner.

MENINGOCOCCAL INFECTIONS

Sulfadiazine is the drug of first choice. Sulfamerazine ranks second. With either drug the initial dose should be large. This is essential if the concentration of the drug in the blood and the cerebro-spinal fluid is to be raised rapidly to an adequate level Large doses help to shorten the duration of the meningeal symptoms and that of chemotherapy An initial dose of 3 Gm. is followed by 2 Gm in 4 hours, then 2 Gm 6 hourly during the first 24 hours followed by 1 Gm 4 hourly on subsequent days Sodium bicarbonate should be given with each dose and the fluids pushed. In comatose patients the dose can be administered through a nasal tube placed in the stomach For the first 24 hours it is preferable to administer the drug intravenously. Hill and Lever (1943) who treated 68 cases with combined intravenous and oral therapy did not lose a case.

In all cases a lumbar puncture should be performed when the patient is first seen, to establish the diagnosis. Repeated lumbar puncture after this seems to be unnecessary.

MISCELLANEOUS INFECTIONS

Actinomycosis

Actinomycis hominis is a parasitic fungus susceptible to sulfonamides, although not as susceptible as some other organisms. Cutting and Geberhardt (1941) showed by invitro tests that sulfanilamide in a concentration of 10 mg per cent inhibited actinomyces hominis to some extent Concentration of 50 to 100 mg per cent checked its growth more or less completely. Sulfathiazole and sulfadiazine were definitely more effective than sulfanilamide in similar concentrations

Lyons et al (1943) reported that sulfonamide therapy in a dosage of 4 Gm. daily over a period of months had reduced striking remissions in aerobic and anaerobic actinomycotic infections. The remissions were characterized by the recurrence of localised abscesses and fistulous tracts which tended to heal under continued drug therapy. Surgical excision of all infected tissue was considered to be the most effective treatment with sulfonamide therapy as a valuable adjuvant. In one case a blood level of 12 mg. per cent of sulfadiazine maintained for a week produced marked improvement.

Numerous other reports indicate that sulfonamides may be of value if given in adequate dosage and for a sufficiently long time Actinomycosis often responds strikingly to penicillin and this is now the drug of choice

Friedlander's Pneumonia

Solomon (1940) reported 17 cases of chronic pneumonia due to Friedlander's bacillus The organism was isolated in pure culture in every instance Sulfapyridine was employed in four patients and all improved Feinstone et al (1940) found sulfadiazine to be most effective against a strain of group B Friedlander's bacillus infection in mice, while sulfapyridine was second and sulfathiazole third

Chancroid (Ducrey's Bacillus)

The satisfactory response of chancroid to sulfonamide therapy has been so universal that failure to respond to adequate dosage throws doubt on the diagnosis Greenwald (1943) states that treatment with sulfathiazole in total daily amounts of 4 Gm in divided doses for 7 days is reliable and free from dangerous complications

Lymphopathia Venereum

Andrews et al (1943) showed that sulfapyridine, sulfathiazole and sulfadiazine have definite activity against the virus of lymphogranuloma venereum. Costello and Cohen (1941) reported 187 cases classified into the inguinal and the anorectal types and found that sulfanilamide by mouth was effective

Stenosing recto-colitis, resulting from the infection responds to treatment by retention enemas containing 3 per cent suspensions of sulfanilamide and sulfathiazole Numerous other observers have reported encouraging results in the treatment of this condition with sulfonamides

Gas Gangrene

Long and Bliss (1937, 1939) found sulfanilamide and sulfapyridine effective against intraperitoneal Cl Welchii infection in mice Bohlman (1937) treated 3 cases of gas gangrene following crushing injuries, with sulfanilamide; all three responded. These results were confirmed by Kennedy (1938), Barker (1939) and Sadusk and Manahen (1939)

From experimental work on mice Long (1941) demonstrated that sulfadiazine was an effective chemotherapeutic agent against infections caused by Cl Welchii and Cl Septique, with sulfathiazole coming next and sulfapyridine as a fair third, while sulfanilamide showed practically no activity In Cl. edematiens infections there was no effect with any of four compounds For best results Stephenson and Ross recommended combined treatment with serum and large doses of sulfonamide

With the introduction of penicillin a combination of penicillin and sulfadiazine will prove considerably more effective

Plague

The most effective drug appears to be sulfamerazine. Sulfadiazine and sulfathiazole are good seconds Sulfonamide is best given both parenterally and by mouth Its first successful use was described by Sokhey and Dikshit (1940) Later Chopra, De Monte and Chatterjee (1941) and Wagle and others used it with encouraging results. During a recent epidemic of the disease in Kanpur it was used by the author with results highly gratifying The dosage used was 4 tablets of sulfathiazole initially followed by 2 tablets every 4 hours At least two of the doses were given as sodium sulfathiazole intramuscularly morning and evening.

Alkalies, plenty of fluids and intravenous glucose were freely given In no case that failed to respond to sulfonamide therapy was success attained by the use of either serum or penicillin. The author's impression is that the value of pencillin in treatment of plague is nil. Streptomycin is, however, of value.

Undulant Fever

Reports on the use of sulfonamide group of drugs in the treatment of undulant fever are so far conflicting Encouraging results have, however, been reported by Neumann (1938), Scholar (1939), Chinn (1940), and King and Lucus (1941) The drug of choice seems to be sulfamerazine The second choice is sulfathiazole.

Rheumatic Fever

The concensus of opinion appears to be that the drug is valueless in treatment of rheumatic fever Zahorsky and Zahorsky (1942), however, stated that poor results were due to the fact that the treatment was not started early. They advised treatment as follows:

Administer sulfathiazole (daily dose $\frac{3}{4}$ to 1 grain per pound) for 2 to 3 days Then discontinue this drug and in a few hours administer, preferably in capsules, equal parts of acetyl salicylic acid and benzoate of soda (daily dose $\frac{3}{4}$ to 1 gr. per pound) Joint and nervous symptoms seemed to be made worse by sulfonamide therapy, but sulfonamides did apparently check the source of infection if used before valvular vegetations appeared.

Sulfonamides seem to have a definite place in the prevention of rheumatic recurrences. Either sulfamerazine or sulfadiazine may be used for this purpose.

BOWEL DISEASES

Sulfonamides have proved of great value in acute bacillary dysentery, in the infective diarrhea of infants, regional enteritis and in the treatment of ulcerative colitis They have also been found useful in the pre-operative preparation and post-operative control and treatment of patients requiring surgical procedures on the intestinal tract

Acute Bacillary Dysentery

Rieter and Marbenge (1941) treated 20 cases of acute bacillary dysentery with sulfapyridine 1 G. t i d. with very encouraging results. Marshall et. al (1941) suggested the use of a soluble but poorly absorbed compound,

sulfaguanidine in the treatment of acute bacillary dysentery. The reported results were good It is now known that sulfaguanidine is not non-toxic as it was originally claimed and cases of hematuria due to sulfaguanidine have been reported. Moreover the dosage has to be very large (0.25 Gm daily per kilo body weight, divided into 4 hourly doses day and night) Sulfasuxidine suffers from the same drawbacks as sulfaguanidine although it is superior to the latter

Recently sulfathalidine has been used in the treatment of bowel diseases. The reported results are even better than with sulfasuxidine Sulfathalidine is given in doses of 1 5 Gm (half that of sulfasuxidine) every 4 hours Sulfathalidine is to be preferred when diarrhea is present When diarrhea is severe the dose should be doubled.

Chronic Ulcerative Colitis

Up-to-date the drug of choice seems to be sulfathalidine. The dosage is 1 5 Gm every 4 hours Recently Major (1946) has treated cases with two new sulfonamides, nisulfadine and nisulfazole with encouraging results.

Cholera

Chopra et al. (1941) reported successful results with sulfaguanidine treatment of cholera Similar results were later claimed for sulfasuxidine. It must be appreciated that sulfonamide compounds can at best be useful adjuvants in the treatment of cholera with intravenous salines.

Infective Diarrhea of Children

Infective diarrhea of children responds to treatment with sulfonamides admirably The preparations of choice are either sulfathiazole or sulfadiazine The author has found the combined use of sulfadiazine and Dover's powder given as three powders in the day, a highly efficacious treatment in infantile diarrhea. The following is a useful prescription for an infant aged 2 months·

R Sulfadiazine ... .. . gr 3¾
Dover's Powder ... ... gr ¼
Sig t i d

For infants aged 6 months to a year the dose is sulfadiazine 3¾ grains and Dover's powder ½ grain For older children and adults the doses have to be increased proportionately

URINARY INFECTIONS

Sulfanilamide is a very great advance in the treatment of urinary infections over the acid requiring antiseptics (hexamine, mandecal) in that it acts in both alkaline and acid reactions and is excreted in the bactericidal concentrations by the kidney that is seriously damaged It has been found effective against infections of the urinary tract due to B coli, B proteus and hemolytic streptococci Sickler has shown that it is more effective against same organism in alkaline than in acid urine It has been rather generally conceded that sulfanilamide has no action on streptococcus fecalis. This same defect is also present in the action of sulfapyridine.

Helmholtz (1940) showed that sulfathiazole is bactericidal for streptococcus fecalis and is effective in concentrations easily reached in the urine for most of the bacteria found in urinary infections. Favourable results in the treatment of streptococcus fecalis infection are also reported by Carroll and others (1940), Abyea and Roberts (1940) and Polland Cook (1940). Sulfathiazole has also been found very effective against infections of the urinary tract due to staphylococci. Helmholtz found that sulfathiazole is bactericidal for six of the commonest bacteria found in urinary infections. A concentration of 20 mg per 100 c c should prove sufficient for the cure of practically all infections except pseudomonas which will probably require 300 mg per 100 c.c The effectiveness of the drug for the various bacteria on an ascending scale is as follows pseudomonas aeruginosa, streptococcus fecalis, E coli, aerobactor aerogenes, proteus ammoniae, and staphylococcus aureus The bacterial range is from 300 to 25 mg per 100 c c There is some variation in the effect of the drug at various pH levels, particularly marked in streptococcus fecalis.

The drug of choice is sulfathiazole and the dosage is similar to that employed in pneumonia or gonorrhea. An initial dose of 4 gm. is followed by 1 gm every 4 hours The total dose is 25 to 35 gm No effort is made to limit the fluids and at least 2,500 c c. are consumed daily.

In cases in which there is recurrence of symptoms after the drug is stopped, urological investigation should be made for presence of urinary calculi, chronic prostatis with residual urine, etc, and proper treatment instituted

It has now been shown by Keefer et al (1946) that the drug of choice in urinary infections is streptomycin

DISEASES OF THE EYE

Bellows (1943) reported on the oral and local use of sulfonamides in affections of the eye He stated that oral administration was of value in the treatment of ocular complications of erysipelas, gonorrheal ophthalmia, trachoma, inclusion blennorrhea, ophthalmitis due to lymphopathia venereum, serpent ulcer, cellulitis of the lids and orbit, endophthalmitis, ophthalmia Applied locally, the drugs were effective in infectious blepharitis and some forms of acute conjunctivitis

OTORHINOLARYNGOLOGY

Sulfonamides may be of value both orally and topically. Bowers (1942) analyzed a series of 793 cases of acute purulent otitis media and concluded that if sulfonamides are given early and in adequate doses the duration of discharge is diminished by about 50 per cent and the number of mastoidectomies by about 50 per cent. When clinical picture strongly suggests the need for mastoidectomy, it is better to operate, and after uncomplicated mastoidectomy it is best not to give the drug. Complicated mastoidectomies require intensive treatment with sulfonamides, but at times it is necessary to discontinue the drug in order to obtain the true clinical picture Chemotherapy is an aid but may produce a false sense of security Curtain (1940) is of the opinion that suppuration of the mastoid requires surgical attention first and then chemotherapy.

Locally *sulfonamide drops and medicated tampons may be employed* after myringotomy.

Turnbull et. al (1943) recommended the use of stabilized solution of sodium sulfathiazole in the treatment of acute and chronic sinusitis, acute pharyngitis and laryngitis, and acute and chronic suppurative disease of the middle ears The formula employed by him was a stabilized solution containing sodium sulfathiazole 2 5 per cent, sodium sulfite 2 per cent d-desoxyephedrine 0 125 per cent. This solution is marketed by E Lilly under the name of Thizodrin Another proprietary preparation for topical use is gluofedrine with sulfadiazine (P. D & Co)

TOPICAL THERAPY

Apart from the topical uses of sulfonamides already considered, sulfonamides are of value locally in the treatment of wounds, intraperitoneal infections, burns and certain dermatoses.

Clean Operative Wounds

The routine use of sterile dry sulphanilamide or sulphathiazole powder has proved to be of great value in all clean operative wounds Key (1941) has used sulphanilamide powder in 150 cases and sulphathiazole in 70 and a mixture of sulphanilamide and sulphathiazole in 23 In none of these patients infections occurred. In this series there has not been any appreciable interference with healing of the wounds The powder used must be sterile.

The rationale of the procedure is that by the use of the drug in this manner a high concentration, that is, a saturated solution of the drug is brought into direct contact with any organisms which may be present in the wound. In addition to placing the powder in the wound before it is sutured, a small amount is sprinkled along suture line after the skin is closed The amount of the drug used is relatively small in most instances only 1 or 2 Gm or even less. It should be borne in mind, however, that the use of the drug in the wound for the prevention of infection does not warrant any letting down in surgical technic.

Contaminated Traumatic Wounds

These include lacerations and compound fractures brought for treatment before sufficient time (6—12 hours) has elapsed after the injury to permit the development of wound infection. Most of the compound fractures in civil life can now be sutured primarily with satisfactory results if sulphanilamide or sulphathiazole powder is implanted in the wound after a complete debridement and closure Contaminated war wounds, however, should not be sutured. This is because when a surgeon debrides and sutures a contaminated wound he should take the responsibility of watching his patient until the danger of infection is over War wounds should be debrided, sprinkled with a mixture of sulphanilamide and sulphathiazole, packed open with petrolatum or plain gauze and immobilized in a plaster cast or splint which will maintain the reduction effected during the operation. Full doses of sulphathiazole should also be given by mouth in cases in which more time than is considered safe has elapsed or in which one is not sure of debridement.

Acute Pyogenic Infections

Under this heading are considered contaminated wounds in which sufficient time has elapsed (over 12 hours) to permit the development of infection and acute hematogenous pyogenic infection, such as acute osteo-myelitis and acute arthritis In the first group the patient has a wound usually a compound fracture in which mixed infection is usually present. He is ill with a systemic infection and his condition demands the use of sulphathiazole orally or parenterally in adequate dosage In addition to the general treatment the wound should be properly drained, foreign bodies removed, devitalized tissue excised and the wound well sprinkled with a mixture of sulphanilamide and sulphathiazole In cases of gas gangrene large doses of polyvalent serum should be given.

In acute osteo-myelitis, sulphathiazole should be given in full doses. As soon as the patient can stand the operation the focus in the bone should be drained No attempt should be made to remove the entire area of the disease. At the operation liberal amount of sulphathiazole powder should be implanted in the wound The wound should then be packed loosely with petrolatum gauze and the part immobilized in a plaster cast For a very toxic patient staphylococcus anti-toxin should be used in addition

In acute pyogenic arthritis the joint should be opened, washed with physiologic saline, a liberal amount of sulphanilamide or sulphathizole implanted in the joint cavity and, as a rule, the joint left open In relatively mild infections the joint may be closed and immobilized

Chronic Pyogenic Infections

These include chronic osteo-myelitis and chronic infections of soft tissues As staphylococci are usually present, sulphathiazole is the drug of choice Dickson and Diveley have shown that chronic osteo-myelitis can be treated surgically and the wound can then be sprinkled with sulphathiazole powder and closed. The operation is most successful when sinuses are excised and all dead bone removed Sulphathiazole in full doses should also be given by mouth.

Intraperitoneal Infections

Mueller (1940) reported 55 cases of abscess following perforative appendicitis treated with intraperitoneal application of sulfonamides; there was no death The total intraperitoneal dose did not exceed 15 Gm. and when larger doses were used, drainage was established The powdered drug was sprinkled into the peritoneal cavity as near the focus of infection as possible without depositing a mass in one place Anderson (1942) used sulfathiazole as an adjunct to surgery in 22 cases of advanced acute appendicitis, with only one death In 17 cases sulfathiazole was administered intraperitoneally and in 5 of these 17, additional sulfathiazole was given intravenously or orally. It was concluded that the immediate use of from 8 to 10 Gm of sulfathiazole intraperitoneally and of 2 Gm in the abdominal wall was most effective.

Gilchrist and others (1943) reported on the successful use of sulfonamides in traumatic peritonitis

Burns

A 5 per cent water soluble sulfadiazine jelly used in conjunction with other measures such as morphine, intravenous plasma and pressure bandages is of value in the treatment of burns

Dermatoses

The skin diseases successfully treated by use of sulfonamides include infected eczema, seborrheic dermatitis, impetigo, acne vulgaris, sycosis, vulgaris and furunculosis A 5 per cent ointment or cream of sulfathiazole is the best preparation to employ

Howes (1946) tested the tissue toxicity of streptomycin, sulfamylon, calcium penicillin, parachlorophenol, tyrothricin and zephrin and also their antibacterial activity in the presence of blood against the common bacteria found in the flora of wounds For local chemotherapy, sulfamylon 5 per cent seemed to be superior to the other substances tested It had the widest range of antibacterial activity and was relatively non-toxic It was active in the presence of pus and blood and was not affected by changes in the acidity of the environment Streptomycin was next best Penicillin was third *Sulfamylon 5 per cent mixed with streptomycin was non-toxic, relatively stable in the wound and had an almost complete range of bacterial activity*

TOXIC REACTIONS

The commonest toxic reactions are dizziness, depression, loss of appetite and nausea and vomiting, the most serious ones are crystaluria and agranulocytosis Among the others the most important ones are fever, dermatitis, anemia and hepatitis. Cyanosis is of not great importance.

1. *Mental Symptoms*—Dizziness, depression, disorientation and decreased mental acuity are commonly explained of especially when large amounts of the drug are ingested Judgment may be impaired, and for this reason caution is required on the part of those driving automobiles or engaged in hazardous occupations Headache and dizziness are rare with sulfadiazine and sulfamerazine. The symptoms clear up on withdrawal of the drug

2. *Loss of Appetite*—This is common complaint but rarely severe enough to stop treatment.

3 *Nausea and Vomiting*—This is intense when sulfapyridine is employed. It is for this reason chiefly that the drug is now almost completely discarded. Nausea and vomiting also occur in about 20 per cent of those undergoing treatment with sulfathiazole It is much less common with sulfadiazine and sulfamerazine

4 *Cyanosis*—It is harmless and otherwise unrelated to respiratory distress Its causation is still not properly understood. Measures usually recommended for preventing it are the avoidance of purgatives (especially sulfates) a low residue diet and exclusion from it of articles like sulphur, eggs, onions, garlics, etc Recent reports tend to show that restrictions placed on these articles are probably too stringent and unnecessary. The author has used sulfates in numerous cases to whom sulfonamides were administered without any unpleasant effects, nor did he think it unnecessary to forbid use of eggs, onions, etc

5. *Fever*—Drug fever occasionally occurs and usually the rise in temperature is noted seven to ten days after the beginning of treatment It may be mistaken for a recrudescence of the original infection although in most cases there is no difficulty in arriving at a decision, since the fever of infection is likely to have been normal or almost so for a few days before the sharp rise of the drug fever sets in It is uncommon when sulfadiazine or sulfamerazine are used.

6 *Dermatitis*—The majority of cases have shown a generalized eruption of the morbilliform type, but rashes of urticarial scarlatiniform, purpuric and even exfoliative nature have been observed on several occasions. In almost every case, the skin manifestations have appeared between the 8th and 14th days of treatment with sulfonamides. It is usual for fever to occur in conjunction with these drug rashes The possibility of a sulfonamide preparation producing an eruption seems to be present, whichever compound is used, if the administration is continued more than 8 days as is often necessary The majority of eruption will rapidly clear with cessation of administration of the drug or appropriate treatment with large quantities of fluids and alkaline diuretics Ephedrine may help to control severe irritation, especially with a pronounced urticarial element Locally calamine lotion has been found the most helpful

7. *Anemia* either of the mild progressive type or acute hemolytic type has been described during treatment with sulfanilamide. The mild progressive type does not indicate a cessation of treatment The acute hemolytic type usually comes on within 3 to 5 days of treatment with sulfanilamide It is accompanied by a polynuclear leucocytosis varying between 20,000 and 85,000 or more and in some cases by jaundice and hepatitis. Prompt recovery follows withdrawal of the drug, the use of blood transfusions and forced fluids.

The incidence during treatment with sulfapyridine and sulfathiazole is from 2 to 3 per cent and when sulfadiazine and sulfamerazine are employed the condition is almost unknown.

8. *Agranulocytosis*—Cases of agranulocytosis have been reported after large doses and prolonged treatment (2 or 3 weeks of continuous treatment) with sulfanilamide and sulfapyridine. The condition is rare during treatment with sulfathiazole, sulfadiazine or sulfamerazine

When it occurs the drug should be withdrawn at once and energetic treatment (forced fluids, blood transfusions, nucleotide, yellow marrow and liver extract) instituted Recently penicillin has been used with success

9 *Urologic Complications*—Toxic effects involving the urinary tract have constituted one of the most important complications of therapy with either sulfapyridine or sulfathiazole Microscopic hematuria, gross hematuria, crystalluria and total anuria with death have all been reported These complications are encountered less frequently during treatment with sulfadiazine and sulfamerazine Combinations of sulfadiazine and sulfathiazole are attended by smaller incidence of urinary complications than either drug alone It is important, therefore, to insist on large amount of fluids during therapy with these drugs It is also important to prescribe equal quantities of sodium bicarbonate together with the sulfonamide

If during treatment urine becomes scanty or anuria develops the drug should be stopped at once and prompt treatment instituted This consists of the following measures. forced fluids; prompt ureteral catheterization (the catheter should be allowed to remain in place until normal urine flow is re-established) with irrigation of the pelves at 2-hourly intervals with warm distilled water at 107°F. alkaline diuretics

SULFONES

Sulfones are a series of compounds related to the sulfonamides. They have been found to be effective against the tubercle bacillus in experimental animals Clinical trials have been made with the sulfones in the treatment of tuberculosis and leprosy and reported results are encouraging The drugs most extensively studied have been DDS, sulfetrone, promin, diasone and promizole.

In the treatment of tuberculosis promizole and sulfetrone have been employed in combination with dihydrostreptomycin and PAS In leprosy, DDS, promin, diasone and promizole have been used individually and in combination with dihydrostreptomycin

The parent compound of this group is diamino-diphenyl sulfone (DDS). There are various derivatives from this parent compound, the most well known of which are promin, promizole, diasone and sulfetrone

Promin (Promanide)—Promin was the first preparation to be used but since it has to be given intravenously and is too toxic by mouth, it is no longer popularly used Promin is sodium P,P' diaminodiphenyl-sulfone-N,N' di-dextrose sulfonate and was synthesised by Tillitson in 1937. Feldman found promin to be capable of bringing about a striking deterrent effect on tuberculous infection in guinea pigs, even though the disease was in existence for a period of six weeks before treatment When treatment was discontinued the animals eventually succumbed to tuberculosis Clinical experience in tuberculosis with promin was not encouraging Toxic reactions of hemolytic anemia, leukopenia and allergic deramatitis were encountered in those taking the drug

Diasone—(Diamidin). It is disodium formaldehyde sulfoxylate di aminodiphenyl sulfone It is said to have been independently and simultaneously synthesised by Raziss and associates and by Bauer and Rosenthal (1943) Feldman, Hinshaw and Mosses (1944) have suggested that the effectiveness of diasone and promin in experimental tuberculosis may be due to the break down of the products to the parent substance 4,4' diaminodiphenyl sulfone. The compound was synthesised on the basis of the knowledge that the conversion of arsphenamine to neoarsphenamine by the introduction of sodium formalde sulfoxylate radical produces a less toxic compound. Diasone was prepared by the introduction of a similar grouping into diaminodiphenyl sulfone. Diasone proved to be quite effective in the treatment of experimental tuberculosis of guinea pigs Peter and Prenzlan (1944) found it to be of some value in the treatment of pulmonary tuberculosis in man. Olson and his colleagues (1945) and Robitzek and others (1946) found it to be of value in some patients. Diasone has been used in the treatment of leprosy with gratifying results. It is less toxic when taken orally. Treatment is commenced by 0 3 Gm. daily in capsules by mouth. If no signs of toxicity appear two capsules of 0 3 Gm. are given daily and if well tolerated the dose is increased to 0·3 Gm. three times

a day. Rest periods of two weeks after every 2 months of treatment are ordered Toxic symptom encountered are nausea, vomiting, skin lesions, headache, anorexia and anemia Frequently treatment with the drug has to be discontinued because of the toxic reactions

Promizole—It is (1-2' diaminophenyl-5' thiazol sulfone) and is unlike the other sulfones effective in experimental tuberculosis The drug has been used alone but particularly in combination with streptomycin in the treatment of tuberculosis Results with promizole in the treatment of leprosy are encouraging The initial dose of 0 5 to 1 0 Gm three times a day by mouth is gradually increased to 6-8 Gm. daily Toxic reactions are rare and mild but resemble those of promin and diasone It is goitrogenic Its use has been abandoned owing to scarcity and cost.

Sulfetrone (Novotrone)—Sulfetrone is very poorly absorbed from the gut, it is therefore better to give it intramuscularly For oral treatment, one tablet (0 5 Gm) is given 3 times a day and the dose is gradually increased to two tablets 3 times a day For the intramuscular route, a 50 per cent solution of sulfetrone in water is used, and injections are given twice a week, beginning with ½ c c and gradually raising the dose to 4 or 5 c c

Promacetin—It is 4,4' diaminodiphenyl sulfone-2-acetyl sulphonamide The daily dose is 2-3 Gms per day by mouth The only side effect in tolerated dosage is a slight depression in the R B C count during the first weeks which rights itself spontaneously

H. E. S—It is 4-amino-4'-B-hydroxy ethylaminodiphenyl sulfone Reports on its use in treatment of leprosy are few but encouraging

Diamino-diphenyl Sulfone—The compound which is at present being most widely used is the parent substance 4-4' diaminodiphenyl sulfone (DDS) Its great advantage is its effectiveness combined with low cost It is given by mouth in very small doses A start should be made with 50 mgm daily and after a few weeks the dose should not be increased beyond 100 mgm a day except under expert advice Toxic effects include anemia, dermatitis and psychosis Anemia responds well to iron therapy and dermatitis to antihistaminics Johansen and Erickson (1950) have reported 6 cases of psychosis among 350 cases treated with DDS It is more likely to occur among those with a pre-existing psychotic background and with higher doses (up to 500 mgm/day) in an uninterrupted regime. DDS is the cheapest and most convenient of all the preparations As all the compounds give rise to hemotological changes it is advisable to make repeated blood counts and hemoglobin estimations in the course of treatment. It is of advantage to continue iron therapy to prevent a decrease in the red cell counts and hemoglobin percentage

ANTI-MALARIALS

In the decade following the end of the first World War Wagner-Jauregg introduced the malarial therapy of neurosyphilis It was soon found out that the naturally occurring disease differed from the blood-produced disease in several important respects The blood induced malaria was easily controlled by small doses of quinine which were quite inadequate for the suppression of clinical malaria or for the prevention of relapses In the blood induced disease the incubation period was sometimes a very short one, whilst with sporozoite induced infection it was much longer, being never less than 5-8 days To explain this discrepancy S. P James (1931) made the original suggestion that sporozoites, on entry into the human body, instead of penetrating the r.b c , as had been generally accepted, passed directly into the tissues, where they underwent a peculiar development in the cells before entering the blood stream This suggestion received considerable support from the work of Kikuth and his co-workers in 1937 They showed that such a cycle did take place normally in the malaria like parasites of canaries In 1937 S P James and P. Tate described a similar cycle in P. gallinaceum the malarial parasite of fowls In 1947 Manwell demonstrated E. E forms in the bat. In the same year Garnham demonstrated cysts in the liver of monkeys with a blood infection of P Kochi In these cysts protozoal masses were demonstrated which obviously represented the E E cycle in these animals In 1948 Short, Garnham and Malamos infected monkeys with P. cynomolgi and found in the liver numerous large plasmodial masses which were obviously the tissue forms. In 1948 Short et al were able to prove the E. E. cycle in P. vivax in a human volunteer

It is now known that when sporozoites of P. vivax are inoculated into a human being by the bite of an infected mosquito they do not directly go into the r.b c On the other hand they completely disappear from the blood for several days During this pre-erythrocytic stage they are to be found in the liver cells in which they undergo development. A fully developed pre-erythrocytic schizont is a large ovoid plasmodial mass and may contain as many as 800 chromatin masses. When this cryptoschizont ruptures it gives rise to cryptomerozoites some of which enter the r b c and start the erythrocytic cycle. The question whether the establishment of blood infection terminates the E. E cycle or it persists as a low grade infection of the liver for prolonged periods has been answered by Short and Garnham who have described the persisting E. E cycle in P. cynomolgi When the cryptomerozoites enter the r b c in due course of time an attack of clinical malaria is produced but on the other hand, other cryptomerozoites enter new liver cells and repeat the process irrespective of whether the erythrocytic cycle is present or held in check by anti-malarial drugs or a naturally acquired immunity. This immunity is active only against the blood forms, the tissue forms being protected by their cell habitat. When the active immunity is impaired the cryptomerozoites which enter the blood are no longer destroyed and start a clinical relapse. Before the commencement of the second World War the only anti-malarial drugs known were cinchona and its alkaloids, atebrine

and plasmochin During the war many new drugs for prophylaxis and treatment of malaria were introduced. The better known of these are proguanil or paludrine, chloroquine and oxychloroquine, nivaquine C, Cam-Aqi and pentaquine

QUINACRINE (Atebrine)

It is a synthetic acridine dye and was developed in 1933 It is yellow, bitter and soluble in water It destroys the asexual forms of organisms causing malaria and checks the progress of the disease as effectively as quinine. Continual daily administration does not prevent infection but suppresses development of the cycles until the administration is stopped It is rapidly absorbed from the intestine. It has a cumulative action and traces may be found in the urine one or two months after cessation of therapy.

Quinacrine is superior to quinine both for clinical treatment and suppression. It is more effective in termination of the attack of vivax malaria than is quinine and in addition cures the malignant form of the disease. Quinine is relatively ineffective in the treatment of falciparum malaria. The dosage recommended is 0 2 Gm combined with 1 0 Gm of sodium bicarbonate with a tumbler of water three times a day after meals In patients suffering from severe attacks or those attended by vomiting or coma, the drug is given 1 M , 0.2 Gm being given into each buttock and 0 2 Gm. repeated 6-8 hourly for 1 or 2 doses. As soon as it is possible oral therapy is resumed and the total dose is 2 8 Gm. in 7 days.

The commonest toxic symptoms are headache and mild gastro-intestinal disturbance giving rise to nausea, vomiting or diarrhea Rarely a toxic psychosis and aplastic anemia occur.

PALUDRINE

Paludrine or proguanil was introduced by the British during the World War II. It is effective in terminating clinical malaria. For this purpose the dosage recommended is 0 3 Gm t i d for a period of 3 or 4 days Thereafter it can be given in doses of 0 3 Gm once or twice a week over long periods as suppressive therapy. It produces radical cure in Malignant tertian malaria. Paludrine is effective both against the erythrocytic and the exoerythrocytic forms Against P. falciparum infections it is a causal prophylactic It is a partial causal prophylactic against vivax infections It does not destroy sexual forms in man but prevents their development beyond the oöcyst stage in mosquito.

CHLOROQUINE (Aralen or SN 7618)

It is a quinoline compound and in the form of diphosphate it is readily soluble in distilled water. It is active against the erythrocytic forms of P vivax and P falciparum It does not prevent vivax infection when used prophylactically nor does it prevent relapses in vivax malaria The drug is most useful in P. vivax malaria as a suppressive agent and in the treatment of the acute attacks In this respect chloroquine is significantly superior to atebrine or *quinine*. In falciparum malaria it abolishes the acute attack and brings about a complete cure of the infection Chloroquine in contrast to atebrine, does not produce gastro-

intestinal irritation in full therapeutic doses in malaria It does not produce yellow discoloration of skin like atebrine and unlike quinine does not give rise to symptoms of cinchonism. For details of dosage see under malaria

NIVAQUINE (SN 6911)

The drug was introduced by the Germans and is effective in controlling clinical symptoms of both vivax and falciparum malaria. The total dose required is 1.8 Gm.

CAMAQUINE (Cam-Aqi)

It is an effective anti-malarial and the course of treatment consists of either two doses of 0 25 Gm. each at an interval of 12 hours or a single dose of 0 5 Gm.

METACHLORIDINE

This is a pyrimidine compound and has been found effective in suppressing natural infections with P. malariae and P. falciparum. Limited data indicate good suppression of P vivax. The dose is 1 to 2 Gm. divided into 4 or 5 portions and given over a week

PAMAQUIN

Pamaquin naphthoate, a yellow, odorless, tasteless powder, was introduced by Germans after the first World War. The compound apparently is active against gametocytes but not trophozoites. It is a true causal prophylactic but is not employed for this purpose as it is highly toxic. Large doses give rise to cyanosis, methemoglobinemia, and hemolytic jaundice with vertigo, weakness, abdominal pain, gastro-intestinal disturbances and collapse. A combination of quinine and pamaquin is a most effective therapy against relapses Dose 20 mg t.i.d. combined with 0.5 Gm quinine t.i d.

PENTAQUIN (SN 13,276)

Like pamaquin it is quinoline compound It is as effective in the treatment of relapsing vivax malaria as pamaquin. It is about half as toxic as pamaquin. Dose 20 mg to 30 mg combined with quinine 0.5 Gm. t i d.

SN 13, 274

The drug was developed at Columbia University by Elderfield and his associates. Clinical trials in man indicate that this compound is about one-half as toxic as pentaquine and about as effective as the latter drug When used in conjunction with quinine it effects cures in about 95 per cent of all malaria relapse cases.

ANTI-ALLERGINICS

HISTAMINE AND ANTI-HISTAMINE DRUGS

Histamine—Histamine is widely distributed in animal and plant tissues It was discovered by Windaus and Vogt in 1907 Barger and Dale (1910) isolated it from ergot and gave it the name ergamine In the same year Yoshimura separated the base from soyabeans In 1912 Mellanby and Twort showed that the flora of the intestinal tract of man could decarboxylate histidine and produce histamine At one time histamine was considered to be one of the causes of intestinal autointoxication This view is not held in much favour today Abel and Kubota (1919) and Best and his associates (1929) demonstrated the presence of histamine in many different tissues Histamine content of different tissues varies widely. The skin, lungs and intestines of most species are rich in histamine, whereas the kidney, pancreas and spleen are histamine poor The significance of this distribution is at present not clear

When injected subcutaneously or intravenously, histamine causes a definite fall in blood pressure which is due principally to capillary dilatation In dog the blood pressure may fall to one-half or one-third of its normal level Small doses have little effect upon the myocardium The perfused mammalian heart is at first slowed and then accelerated Repeated intravenous injections will ultimately produce dilatation of the right side of the heart due probably to increased resistance in the blood vessels of the lungs Large sympatholytic doses of atropine are incapable of antagonizing the systemic depressor or the pulmonary pressor effects of histamine

Subcutaneous or intravenous injections of histamine produce a prompt contracture of the smooth muscle of the bronchioles, a swelling and edema of the bronchial mucosa and a constriction of the pulmonary arteries These effects are antagonized by epinephrin or atropine

Histamine injections increase salivary, gastric and pancreatic secretions An intramuscular injection of 0 5 to 1 c c of solution of histamine acid phosphate (1 in 1000) produces a prompt gastric response in normal individuals or subjects with pseudoachlorhydria

The uteri of rabbit guinea pig and cat are strongly contracted by histamine So is excised, parturient or post partum human uterus

When histamine in high dilution is applied to a scarified area of the skin or injected intradermically a "triple response" takes place Dale and Laidlaw (1910) called attention to the striking resemblance between the response to histamine injection and anaphylactic shock reaction The question as to the part played by histamine in producing allergic reaction in man has been investigated repeatedly Dragstedt (1945) who reviewed the literature extensively points

out that many investigators have duplicated partially or entirely in man many allergic reactions by the injection of histamine A number of workers have found an increased histamine concentration in the blood of patients suffering from allergic disorders. The role of histamine, however, in the etiology of allergic disorders is still unsettled

Anti-histamine Drugs—Sympathomimetic drugs were for a very long period of time the only agents valuable in the treatment of allergic disorders Search for better anti-allerginics continued and still continues because the sympathomimetics are not entirely suitable The enzyme histaminase (torantil) was investigated and found to be of doubtful value. Histamine and histamine azoprotein were then investigated but found wanting. In 1933 Forneau an eminent rench investigator introduced F 929 which could protect guinea pigs against two lethal doses of histamine The drug was, however, found to be toxic In 1939 Staub studied another compound in Forneau's series in which the ethylamine side chain was attached to the benzene ring through the nitrogen atom This compound F 1571 was also found toxic but the search resulted in the discovery of other ethylamine compounds more effective and less toxic than Staub's compound The French introduced antergan and neoantergan and the Americans introduced a large number of effective anti-histaminics beginning with benadryl. Among the more commonly used compounds today are benadryl, pyribenzamine, antistin, anthisan, thenylene, thephorin, hetramine, neohetramine and histadyl.

Anti-histamine drugs compete with histamine in attachment to cell receptors and in this manner block or obliterate the activity of histamine in the living tissues

Benadryl—Loew, Kaiser and Moore (1945) studied a large number of synthetic compounds exhibiting anti-histamine activity. Benadryl was found to be outstanding in the series One of their criteria of measurement of effectiveness was the capacity of the substances to protect guinea pigs against exposure to aerosol histamine The anti-histamine drugs were administered either orally or parenterally Without previous administration of an anti-histamine drug, normal guinea pigs upon exposure to the histamine mist rapidly die from acute bronchoconstriction and the resulting asphyxia Benadryl was found to be two to four times as active as many of the compounds of similar structure which were examined It was thirty times more effective than aminophylline Wells et al (1945) showed that benadryl was capable of preventing most of the depressor response of histamine in the anesthetized dog From their experimental work these authors suggested that benadryl exerts anti-histaminic action through absorption phenomenon on the target cells.

Loew et al. (1946) measured the spasmolytic activity of benadryl in antagonizing the spasm of an excised guinea pig's ileal muscle induced by histamine, barium chloride and acetylbromide. Benadryl was found to be spasmolytic when the spasm was produced by histamine, and also by barium chloride or acetyl choline The substance is therefore not entirely specific but the specificity of benadryl for histamine on guinea pigs ileum approaches the selectivity which atropine exhibits for acetylcholine.

Chemically benadryl is closely related to the French anti-histaminics It contains the ethylamine grouping and is a substituted benzyl ether

Pyribenzamine—Shortly after the introduction of benadryl into medicine, another anti-histaminic drug, pyribenzamine (PBZ) was introduced Chemically it is related to benadryl but like the French compound neoantergan, it contains a pyridine nucleus

Pyribenzamine is a powerful anti-histaminic and protects guinea pig's against 100 lethal doses of histamine Mayer (1946) found that it was capable of antagonizing effectively the action of histamine on such structures as the rabbit's and guinea pig's intestine, the guinea pig's uterus, isolated lungs and bronchi

Hetramine—This compound was synthesized by Friedman and Tolstoouhov (1946) and studied by Feinstone and his associates Chemically both hetramine and neohetramine are ethylamines Neohetramine has been employed by Criep and Aaron (1949) in pediatric practice

Compound 3277—Introduced by Halpern and Ducot in 1947, it is chemically an ethylamine Halpern and Ducot contend that it will protect guinea pigs against 1500-1600 lethal doses of histamine

Histadyl—Chemically like the foregoing compounds it is a substituted ethylamine Lee and his associates (1947) studied it and found it to be an active anti-histaminic on the guinea pig's intestine It also antagonized the depressor response of histamine in the cat.

Feinbery (1947) used the drug in 250 cases exhibiting allergic symptoms and is of the opinion that the drug is an effective anti-histaminic with a low incidence of side reactions

Dramamine—It is an anti-histaminic drug, chemically an ethylamine that has been found to be of value in the treatment of motion sickness and sickness of pregnancy. The dose recommended is 50 to 100 mg before meals and on retiring

Thephorin—Thephorin is an anti-histamine compound which differs from the compounds mentioned so far in that it does not contain an ethylamine radical It was studied by Lehman et al (1947) and by Levin and Moss (1949) The drug has been used extensively in pediatric practice and appears superior to neohetramine Levin and Moss used it in the treatment of 109 children suffering from allergic disorders Relief was obtained in a large majority and the side reactions were minor and few.

It appears that anti-histaminic properties are present in many types of organic structure and the fundamental ethylamine linkage is not essential to the molecule

Clinically the anti-histaminics have been found to be of value in the treatment of hay fever, allergic rhinitis, common cold, urticaria, drug sensitization, serum sickness, contact dermatitis, motion sickness, vomiting of pregnancy and histamine headache In asthma they have not given results comparable with those in the diseases above mentioned.

There are many comparative studies of the effectiveness of these drugs in the literature Benadryl seems to be more effective in some patients and pyribenzamine in others. Epstein found benadryl and pyribenzamine about equally effective in the treatment of urticaria, hay fever, allergic rhinitis, and pruritus. He found benadryl superior in asthma.

Feinberg (1946) found pyribenzamine more effective than benadryl in perennial vasomotor rhinitis, seasonal rhinitis and asthma with cough Thephorin appears to be the favoured drug in pediatric allergy.

The usual mode of administration of anti-histaminics is oral but the drugs may be used parenterally. Pyribenzamine has been used as an aerosol from a De Vilbiss No 40 atomizer and the mist squeezed by about six squeezings repeated every 2 to 3 hours will often relieve nasal congestion not relieved by oral pyribenzamine.

The commonest side effects of anti-histaminics are sedation and drowsiness Other side reactions are nausea, headache, vertigo, xerostomia, restiveness and occasionally gastro-intestinal distress. Black and Hayes (1948) have reported a fatality in a woman after 100 mg of benadryl and Rives et al (1949) in a child aged 20 months from use of 100 mg thenylene.

Aleudrin

Aleudrin or isopropyl epinephrin is used in the form of linguets or as a mist (1 in 200) in a hand nebulizer Its use in asthma is described in the section under Miscellaneous Drugs

Orthoxine

Orthoxine is a synthetic sympathomimetic used by Curry, Fuchs et al in the treatment of asthma They introduced transient attacks of asthma in 12 bronchial asthma patients by intravenous injection of 0 01 to 0 04 mg histamine base or by intramuscular injections of 1-6 mg. methacholine chloride The amount of protection afforded to these patients by 200 mg of orthoxine and 30 mg ephedrine was comparable for the two drugs Orthoxine did not give rise to jitteriness which ephedrine produced in some subjects Schiller et al. (1949) consider orthoxine not quite so effective as ephedrine in relieving symptoms of asthma but credit it with the advantage of causing less disturbance of the cardiovascular and central nervous systems

Intravenous Procaine

Intravenous procaine has been recently used in the treatment of allergic disorders For a full description refer to the appropriate head under Miscellaneous Drugs.

ACTH and Cortisone

See under Miscellaneous Agents

Nitrogen Mustards

See under Miscellaneous Agents

MISCELLANEOUS AGENTS

ACTH AND CORTICAL HORMONES

ACTH was isolated by Sayers et al (1943) and Li et al (1943) It is a sulfur containing protein with a molecular weight of about 20,000 Fishman (1947) described a method for preparing a potent concentrate from pig pituitary glands which source appears to be richer in the hormone than the glands from either sheep or beef

ACTH acts by stimulating the secretion by the adrenal cortex of steroid substances which circulate in the body and affect various tissues Since this is the only known action of ACTH, the actions, the uses and the untoward effects of both ACTH and the cortical steroid hormone, cortisone, will be described together and significant differences observed when the two compounds are compared.

A variety of "alarm" stimuli——trauma, cold, infection, starvation, etc——cause increased secretion of ACTH and secondarily of cortisone or a related steroid Since the alarm stimulus depletes the content of cortical steroids in the tissues, the deficiency may stimulate release by the pituitary of ACTH. It is also known that adrenalin increases the secretion of ACTH and that alarm stimuli increase the secretion of adrenalin

The effect of ACTH depends on the ability of the adrenals to secrete cortical steroids In a patient with a diseased adrenal gland, the response to a standard dose of ACTH may be insignificant, whereas in a patient with a healthy adrenal gland the response may be great. The stimulation of secretion of several steroid hormones by ACTH therapy as distinguished by administration of a single hormone like the cortisone may be a therapeutic advantage in some conditions such as allergic diseases.

There are two readily measurable criteria for therapeutic activity of ACTH and cortisone One is a diminution of 50 per cent. or more in the circulating eosinophils in the blood 4 hours after administration of either substance, the effect persisting for 2 or 3 days after cessation of therapy. The other is an increase in urinary excretion of 17-ketosteroids from about 10 to about 30 mg per 24 hours, and also a slight increase in excretion of 11-oxysteroids, following the administration of 100 mg of ACTH; after 100 mg of cortisone have been given there is increase of 11-oxysteroids and a diminution of the 17-ketosteroids in the urine Some patients show eosinopenia but no increase in urinary 17-ketosteroids or therapeutic benefit after ACTH. On the other hand in some allergic disorders there is therapeutic activity and an increase in the 17-ketosteroids but no eosinopenia after ACTH administration. The eosinopenia is, therefore, a very useful but not always dependable criterion of enhanced adrenal steroid activity.

Actions—The actions of ACTH and cortisone are complex and include effects on other endocrine functions, metabolic effects, neuromuscular effects, immunologic effects, cytologic effects and enzymic effects.

Prolonged therapeutic administration depresses function perhaps through depression of pituitary thyrotropic effect. Gonadal function is depressed perhaps through inhibition of pituitary gonadotrophin Menstruation may be delayed The effect on the posterior pituitary is indicated by a correction of the antidiuretic condition of Addison's disease. Both ACTH and cortisone give rise to decreased utilization of carbohydrate, increased gluconeogenesis and hyperglycemia There is an increased demand for insulin production which is adequately met by most individuals Hypoglycemia may follow cessation of therapy

The metabolic effects include those on carbohydrate, fat, protein and electrolyte balance. Both substances give rise to retention of water, sodium and chloride and an increased loss of potassium With ACTH the retention of water, sodium and chloride is much more marked and persistent. Either substance used over a prolonged period gives rise to a low-potassium, low-chloride alkalosis There is a decreased utilization of carbohydrate which is associated with increased mobilization and utilization of fat Phosphorus, calcium, nitrogen and uric acid excretion are increased Serum cholestrol is increased after ACTH but not after cortisone administration

Certain neuropsychiatric disturbances present in Addison's disease are corrected by administration of ACTH or cortisone The alpharhythm in electroencephalogram of Addison's disease is corrected and there is euphoria after large doses of cortisone. The hypokalemia and hypochloremia together with sodium retention which follow the prolonged use of cortisone may result in muscular weakness.

An increase of antibody globulin has been reported but this has been refuted and a consistent rise of gammaglobulin has not been demonstrated. In patients suffering from rheumatic fever that respond to therapy with ACTH or cortisone, the titer of antistreptolysin O in the blood decreases The tuberculin skin reaction and some but not all manifestations of anaphylaxis or hypersensitivity are inhibited by both agents. Asthmatic patients receiving ACTH or cortisone show a decrease in the histamine and an increase in the histidine excreted in the urine.

Both substances cause an increase in the reticulocytes, erythrocytes and neutropenic leucocytes and a decrease in the lymphocytes and eosinophil leucocytes

Alterations in certain enzyme systems have been observed and include an increase in gastric pepsin and mucus without change in acidity, a decrease in lysozyme activity of the feces in cases of chronic ulcerative colitis, an increase in liver and kidney arginase, an increase in blood serum peptidase, a decrease in blood glutathione, and an increased melanin pigmentation of skin and nails due perhaps to inactivation of sulfhydryl groups. Cortisone inhibits the spread-

crises of tabes dorsalis and acute stage of poliomyelitis It is contraindicated in cases of peptic ulcer and side effects include flushing, postural hypotension, goose flesh, chilly sensations, nausea, vomiting, abdominal pain and diarrhea. The dose is 10-50 mg orally every 4 hours or 25-50 mg. intramuscularly 1-4 times daily.

Dibenamine (Smith, Kline and French)—This is the most potent adrenergic blocking agent known. It is not active when administered orally and the difficulties of intravenous injection preclude its general clinical use In normotensive subjects there is no significant effect on blood pressure, heart rate or electrocardiogram In early benign hypertension the blood pressure is lowered for 24-72 hours following an intravenous injection, but not in patients with advanced organic vascular changes It relieves attacks of encephalopathy in cases of malignant hypertension.

It increases peripheral blood flow and elevates the temperature of the skin particularly in cases of neurogenic vascular spasm and has been used with benefit in the treatment of Buerger's disease, Raynaud's disease, frost-bite, acute arterial occlusion Response of blood pressure to dibenamine provides better clue to the result to be obtained from surgical sympathectomy than does the response to TEAB Dibenamine has been found to relax spasm and enable swallowing in patients suffering from cardiospasm or achlasia, to reduce intraocular tension in acute glaucoma and prevent arrythmia during deep cyclopropane anesthesia. It has anti-histaminic activity as can be demonstrated by its action on guinea pig ileum It has been found useful in schizophrenia in which condition it improves catatonia but increases verbalization

The untoward effects are orthostatic hypotension, nasal congestion, miosis, and loss of time perception in some cases

Flaxedil—It is a new well tolerated curare-like compound which has shown value in surgical and non-surgical procedures It has all the advantages of natural curare but it is easier to administer and less likely to give rise to disturbing reactions The dose is 1 mg./kg. intravenously.

Procaine—Intravenous procaine has been used in the treatment of such varied disorders as serum sickness, bronchial asthma, chronic urticaria, pruritus associated with jaundice or Hodgkin's disease, skeletal muscle spasm, peripheral vascular inadequacy and as an analgesic in burns, post-operative cases, hypertrophic and atrophic arthritis, low back pain, neuritis, angina pectoris following coronary thrombosis, herpes zoster, thrombo-angitis and thrombophlebitis and scleroderma It is recommended in the treatment of post-operative anuria and anuria encountered after use of sulfonamides Procaine has been advocated for stabilization of cardiac rate and rhythm in conditions in which these are abnormal before or during surgical procedures A 0 1 per cent. solution in physiological saline or 5 per cent glucose in water is recommended to be given slowly intravenously (20-30 drops a minute). Dose for children of 2-5 years is 125-250 c c, for 5-10 years 150-500 c c., 10-15 years 500-750 c c. The patient should be given an appropriate dose of phenobarbital 20 minutes before starting

the infusion Sodium amytal for intravenous use in case of excessive C. N S stimulation, should be at hand

A. M Boyd (1949) states that it is not sufficiently appreciated that acute thrombophlebitis responds dramatically to paravertebral sympathetic block He describes the technic for inducing the block. The patient lies on the unaffected side with knees and thighs well flexed to straighten out the lumber curve A pillow is placed under the loins to open out the space between the transverse processes A point is taken three finger breadths lateral to the second lumber spine, but the exact distance depends on the patient's size Unless he is unusually obese, an ordinary 12 cm needle will do The needle is introduced at an angle of about 20° from the horizontal plane After the point strikes the transverse process, it is directed above or below the process and advanced a further two vertebra After aspiration to verify that the point of the needle is not in a blood vessel, 20-30 c c of 2 per cent procaine hydrochloride is injected It flows up and down the paravertebral gutter

Treatment of migraine and resistant cephalalgia with procaine aerosols and ergotamine tartarate aerosols is reported by Tabart (1950) Given in aerosol form procaine may act as a general sympatholytic agent and possibly specifically on the sphenopalatine ganglion Aerosols of 0 05-0 1 Gm of 1 per cent procaine or 0 05 to 0 1 mg ergotamine are recommended

Intrasynovial injections of procaine (10 c c of a 2-3 per cent solution) have been employed with success (Berger 1951) in the treatment of osteoarthritis which failed to respond to intravenous procaine

Aluminum Gels

Aluminum carbonate gel and aluminum hydroxide gel are valuable agents in treating renal phosphatic calculi Administration of aluminum gels results in formation of insoluble phosphate salts in the intestines and reduction in the amount of phosphorus absorbed. During gel administration there is a fall in the inorganic phosphorus serum level, a smaller phosphate ion load on the renal tubules and its more complete tubular resorption Short and Carter (1950) report treatment of 22 patients with 36 kidneys which were previous sites of phosphatic calculi, with aluminum gels over a period of 2 to 7 years In six kidneys from which phosphatic calculi were previously removed, there were no recurrences In only 3 out of 30 with calculi did the stones increase in size In four the stones disappeared, in three they became smaller and in the other 20 their size was unchanged Amphogel or amphogel tablets were employed The dose of former ranged between 90-200 c c daily divided into 5 doses, one hour after food and at bed time, the daily dose of the latter was 40 tablets also divided into 5 doses

Antabus

Antabus is an item of commerce in the rubber industry and physicians have known for some years that workers with it and some other chemicals develop an intolerance to alcohol When a person has taken 1 Gm. of antabus

12 hours previously, intake of alcohol results in the following symptoms: after 5 to 15 minutes a feeling of heat in face; a few minutes later, intense purple red vasodilatation of the blush area, sometimes involving the arms; characteristic vasodilatation in the scleræ and slight edema in the loose connective tissue under the lower eye lids Skin temperature is raised in the blush area, pulse rate increases to 120 and blood pressure is unaltered or slightly depressed Sometimes nausea begins 30 to 60 minutes after consumption of alcohol; flushing is then replaced by pallor and considerable fall in systolic and diastolic blood pressure Copious vomiting may occur. Larger doses of alcohol may cause dizziness and occasionally unconsciousness for as long as half an hour. The patient is generally intensely uncomfortable, with pulsating headache and palpitation, subjective dyspnea, a feeling of constriction in the neck and a premature hang over

Discomfort is so intense that it prevents further use of alcohol by an overwhelming majority of persons so long as they are under the influence of antabus The blood acetaldehyde level is increased in the treated persons to 5 or 10 times that seen when the same amount of alcohol is ingested by untreated persons There is no doubt that the clinical effect of alcohol after antabus is due to an action of antabus on the enzymes oxidizing alcohol in the organism. The maintenance dose of antabus lies between 0 25 and 0 75 Gm daily About 20 per cent of patients complain of tiredness which persists 1 to 2 months but gradually disappears with treatment. Caution is needed in patients with heart failure The drug is contraindicated in diabetes Psychotherapy and social rehabilitation are required in addition to treatment with antabus.

Atebrine (New Uses)

New uses for atebrine include its employment in the treatment of tapeworm infestation and in conjunction with carbarsone in the treatment of amebic dysentery In tapeworm infestation the patient is hospitalized and given a light supper on the night before the treatment. Atebrine hydrochloride is given orally, 0 2 Gm every 10 minutes for 4 doses; 0 6 Gm. sodium bicarbonate is given each time and 2 oz sodium sulfate is given two hours after the last dose Hockenga (1951) treated 40 patients with very encouraging results

In amebic dysentery 0 1 Gm. atebrine 4 times daily for 10 days is combined with carbarsone 0 25 Gm. twice daily for 10 days Stools rapidly become negative and rectal healing takes place Relapse rate of 12 per cent in patients followed for 60-395 days compares favourably with rates after other forms of therapy.

Atebrine and diodoquin may also be combined in the treatment of amebic dysentery.

Anti-Coagulants

Heparin—Heparin sodium is the hydrated sodium salt of a naturally occurring complex organic polymer. It is very soluble in water and the aqueous solutions are nearly neutral The substance is prepared from liver or lung

tissue Its sole use in medicine is to prolong the clotting time of blood and this it does by antagonizing the activation of prothrombin to thrombin As heparin acts in the presence of blood to prevent thrombin formation, the substance will prolong the clotting time of shed blood. It is used clinically in the following conditions: to prevent clotting during transfusion, to prevent post-operative thrombi and to combat phlebitis, thrombophlebitis and pulmonary embolism Its use in coronary disease is discussed under that head Two recent uses for heparin are in the treatment of frost-bite and burns.

The principal untoward effect is the hemorrhagic tendency caused by the prolonged clotting time of blood If excessive bleeding occurs at the site of operation, purpura, ecchymosis, hematuria or other hemorrhagic manifestations, heparin should be discontinued Its action may be checked by transfusion Salmine sulfuric acid (a protamine) inactivates the action of heparin in-vitro and in-vivo The protamine sulfate if given by vein, 5 to 10 c c. of a sterile 1 per cent. solution, brings the coagulation time of the blood instantaneously to normal

Heparin sodium is available in solution and each c c contains 10 mg The solution is generally given i v. by drip after dilution with normal saline A dose of 50 mg will prolong the clotting time from 4 to 5 minutes to 15 to 30 minutes This will obtain for about two hours Heparin is now marketed in a gelatin dextrose vehicle for subcutaneous administration It takes immediate effect and produces a prolonged action lasting about 48 hours Recently there have been reports of sublingual administration of pellets (125 mg) of heparin sodium Disintegration was rapid and blood clotting time was effectively prolonged.

Dicoumarol—Dicoumarin is the agent responsible for the sweet clover disease in cattle. It was isolated and synthesized by Campell and Link Its advantages over heparin are that it can be given orally, it has a prolonged action and it is cheap Unlike heparin, dicoumarin prevents coagulation in-vivo, but not in-vitro, also its action is not manifested until at least 24 hours after administration.

Dicoumarin prolongs the clotting time of blood by its capacity to diminish the prothrombin level of blood It is suggested that it might exert its action by interfering with utilization of vitamin K by the liver.

The principal toxic effects of dicoumarin in the therapeutic doses are hemorrhagic manifestations. These can be counteracted by synkayvite and blood transfusion.

Dicoumarin is used alone or with heparin in the treatment of post-operative thrombophlebitic and pulmonary embolism It is valuable in acute embolic and thrombotic occlusion of peripheral arteries Its use in coronary thrombosis is now well established. It is contraindicated in persons bleeding from any cause and in patients with hepatic disease or renal impairment. It should be administered when facilities are available for repeated prothrombin estimations.

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The dose on the first day is 200 to 300 mg, on the 2nd day 200 mg and on subsequent days 100 to 200 mg if the prothrombin activity is more than 25 per cent. If it is under 25 per cent the daily dose is omitted

Tromexan—Tromexan is ethylic ester of 4, 4-diosycumarinyl-acetic acid. Its activity is manifested within three hours after oral administration and reaches its maximum in about 20 or sometimes 24 hours and stops promptly after suspension of treatment so that physiologic prothrombinemia is re-established within 48 hours Tromexan is marketed in 300 mg tablets divisible into halves The radical treatment consists of 1,200 mg. for 2 to 4 days and, after a short intermediary period determination of the maintenance dose 300 to 400 mg Prothrombin time must be verified daily during the first week, once it is stabilised round 20 per cent. one or two determinations a week suffice. If prothrombin time cannot be determined regularly it is best to employ the safe method 3 tablets on the first day, 2 or 3 the second, 2 the third, and 1 on the subsequent days It is important to distribute the medicine evenly over 24 hours

Cumopyran—It is a new anti-coagulant introduced by Abbot Laboratories. It has been shown to be two to three times as potent as dicoumarol Other advantages for this compound include. (*a*) the action of a specified dose is more predictable, (*b*) the desired prothrombin level is easier to maintain, (*c*) onset of action is more rapid; (*d*) the effect is more prolonged; (*e*) there is less capillary toxicity, (*f*) there is little or no gastro-intestinal disturbance, (*g*) there is much less patient resistance

Pantol—It is a new synthetic anti-coagulant The dose is 2 mg/kg and 5 mg/kg in 1-10 per cent. solution intravenously The clotting time is significantly prolonged after pantol injection over a period of 8-12 hours Like heparin it causes a slight increase in prothrombin time The untoward reactions that may follow its use are fall of blood pressure, vascular collapse and paresthesia in the extremities

Treburon—Treburon is yet another of the new heparin-like anti-coagulants. The dose is 625 mg in 2 5 c c of water intramuscularly every 12 hours. Coagulation time should be determined before each injection during the first 36 hours and thereafter once a day before one of the injections.

Indications—Thromboses of the extremities, post-operative thrombosing venous complications, pulmonary embolism, myocardial infarction, degenerative arterial disorders of the lower extremities and, cerebral thromboses and embolism It is contraindicated in cachexia, severe toxic infectious states, hepatocellular lesions and hemorrhagic diathesis It is also contraindicated in acute nephropathies.

Anti-Heparin Compounds

Abnormal bleeding may result from a heparinoid disturbance in the clotting mechanism Anti-heparin compounds, protamine sulfate and toluidine blue are successful in arresting spontaneous hemorrhages due to increase of heparinoid

substances in the blood The treatment has been found to be of value in post-partum hemorrhage, acute and chronic leukemia with bleeding, radiation hemorrhage, bleeding after nitrogen mustard therapy in Hodgkin's disease, bleeding secondary to uremia and nephritis, menorrhagia and excessive vaginal bleeding at puberty. Treatment is of no value in idiopathic thrombopenic purpura, in patients with prothrombin deficiency and hemophilia Protamine sulfate is injected i m 50 mg in 5 c c every 4 to 6 hours The dose of toluidine blue is 6 to 8 mg per kg body weight daily for three or more days The drug is given dissolved in normal saline after passing through a seitz filter for sterilization and removal of all undissolved particles. It is administered i v over a two hour period

Anti-Hemophilic Globulin

It is a sterile preparation containing a fraction of normal human plasma of unknown composition which is capable of shortening the spontaneous clotting time of hemophilic blood when it is shed It is used to control the bleeding of hereditary hemophilia and periodic intravenous injection appears to produce, in many cases, bleeding times that are within normal ranges It should be stored at temperatures between 2° and 10°

BAL (Dimercaprol)

BAL (British-Anti-Lewsite, 2, 3-dimercaptopropanol) was introduced by the British during the World War II They developed the substance on the basis of a fundamental theoretic concept which led to in-vitro studies indicating that it was able to compete successfully with thiol containing tissue enzymes, in attracting the poisonous metallic ion BAL is of value in poisoning due to organic arsenicals, mercury poisoning and poisoning with nickel, gold, cobalt, antimony or bismuth salts It is ineffective in lead, thallium or selenium poisoning

In acute arsenic poisoning 3 mg/kg is injected intramuscularly and repeated 4 hourly during the first two days The treatment is continued for 10 days, but the frequency of injection is gradually reduced to two a day

BAL itself has toxic properties if given in an overdose Against these babiturates are said to act beneficially

Bistrimate

Bistrimate is one of the newer bismuth salts available for oral administration, which gives promise of being empirically effective in a number of varied dermatoses Encouraging results are reported after its use in juvenile flat warts, verruca lupus, verruca plantaris, chronic discoid lupus erythematosus, acute disseminated lupus erythematosus and lichen planus The dose is 1 tablet of 75 mg t.i.d after meals for 3 days and if there is no intolerance, thereafter 2 tablets 3 times a day. Dose for children is estimated according to age and weight

Calsol

(Sodium Ethylenediamine Tetra-acetic Acid)

This reagent forms a soluble complex with calcium and has been used in-vitro and in experimental animals for dissolving urinary calculi Robert F Gehres and Samuel Ramond (1951) used 1-3 calsol solutions at pH 7-8 for irrigating the urinary tract Four of six artificially implanted urate calculi were rapidly dissolved from the bladder in rabbits by irrigation with calsol

Continuous or intermittent urinary tract irrigation with calsol in seven patients, resulted in some dissolution of stones varying from an estimated 25 per cent reduction to complete dissolution. Failures were attributed to improper irrigation technic or to improper contact between the solution and the stone because of its position

Dexamyl

Dexamyl is a combination of dexedrine and amytal designed to produce anorexia while eliminating the stimulating effects of dexedrine Each tablet contains 5 mg dexedrine and 32 4 mg amytal and three doses are recommended to be given 2 hours before each of the principal meals Ella Roberts (1951) treated 59 patients who showed a satisfactory weight loss in three months

Dextran

Dextran is a water soluble, high molecular polysaccharide. It is formed in solutions of sugar inoculated with a special bacterium Gronwall and Ingleman (1915) and Bull, Rickets and their associates (1919) recommended its use as a plasma substitute Necropsy studies in dogs, however, given large quantities of dextran revealed focal degenerative lesions in the liver and kidneys. According to Beckman the drug certainly cannot be recommended for general use.

Diasal

Diasal is a proprietary salt substitute containing chiefly potassium chloride. Rimmerman and Halpern (1951) studied a number of salt substitutes and found that diasal most closely resembled sodium chloride in taste, poor in quality, appearance and stability

Dimethyl Guanidine

It consists of dimethylguanylguanidine hydrochloride and sodium sulfathiazole and has shown possibilities in the treatment of common cold In cold ranging from simple coryza to chronic sinusitis 95 per cent recovery was obtained in the 200 cases A dose of 1 c c of the combination contains 0 015 Gm of flumamine and 0 025 Gm of sodium sulfathiazole Following this dose headache is said to disappear in 10 to 15 minutes, to be followed with gradual dryness of the nasal mucosa in a just beginning coryza In chronic cases, an average series of six injections of one c.c into the deltoid will provide recovery from all clinical symptoms.

Dimethyl Phthalate (DMP)

Dimethyl phthalate is an insect repellent without any characteristic odour for man and yet when a mosquito alights on skin treated by it, it leaves it as suddenly as if it had touched a hot metal plate A mixture of dimethyl phthalate 6 parts, ethohexadiol 2 parts and butopyronoxyl 2 parts is particularly effective and used to ward off mosquitos, biting gnats and red bugs. Myelol (Boots) is a preparation of dimethyl phthalate

Dramamine

It is an anti-histaminic drug and is used chiefly for motion sickness and sickness of pregnancy Chinn et al (1950) regard benadryl more effective than dramamine in motion sickness Dramamine has been used with success to counteract morphine effects and to prevent the nausea and vomiting that follow preanesthetic medication (morphine and hyoscine) and inhalation anesthesia A single dose of 100 mg is recommended 45-60 minutes before preanesthetic medication

Eurax

Eurax is a new scabieticidal agent used as a 10 per cent ointment Tronstein (1949) treated 89 patients with the drug Half the contents of a 70 Gm tube were applied from jaw to foot and the other half was applied the following bed time The patients bathed and put on clean clothes next morning. Many of the patients had pyoderma Eighty eight were cured

Exchange Resins

Kraemer and Lehman (1947) introduced a synthetic resin (anion exchange resin) for the medical treatment of peptic ulcer It removes acids from solution by direct adsorption Resinat is a commercial variety of anion exchange resin available in capsule, tablet and powder form The dosage in peptic ulcer therapy is 0 5 Gm at hourly intervals daily for one week, then 0 5 Gm each two to three hours while the patient is awake Hall and Hornisher (1950) report that average healing time of duodenal ulcers in controls was 33 7 days as compared with 19 days in the resinat group

Cation exchange resin (ammonium cation resin, Permutitz or WIN 3,000) when given in doses of 45 Gm daily by mouth binds sodium and potassium in the food The ammonium chloride is absorbed, whereas the sodium and potassium bound to the resin, continue down the gastro-intestinal tract The consequent reduction of sodium absorption from the intestine is useful in the management of edema due to congestive heart failure, constrictive pericarditis and cirrhosis of the liver Kleiber and Picker (1951) report a case in which routine therapy in congestive heart failure was of no avail but on 6 heaping teaspoonsful of a carboxylic resin, digitalis and ammonium chloride and 2 c c mercuhydrin every 3 days, improvement was rapid He improved subjectively at first but began to lose weight after two weeks Omission of the resin for 10 days

caused a 10 lb increase in weight, but when it was resumed he lost 25 lb The resin was given 4 days a week; 10 drops of potassium iodide was given daily for the rest of each week

Lipman (1951) used WIN 3,000 in the treatment of nephrotic edema with success The resin was administered for 5 days with a two-day interval, followed by another course Two or three such courses are usually sufficient and the lapse of treatment prevents occurrence of acidosis and electrolyte deficiencies

The ammonium chloride absorbed after administration of these resins and the interference with base absorption may lead to acidosis and this requires caution in the use of resins in patients with renal insufficiency. For the same reason it is advisable to use resins intermittently. Depletion of calcium and potassium can be prevented by a high milk diet and potassium iodide

Folic Acid Antagonists

Damashek (1949) reports treatment of 4 children and 31 adults with acute and subacute leukemia with folic acid antagonists The preparations used were aminopterin, amethopterin, amino-an fol and a-minopterin The agents were dissolved in sterile normal saline and injected intramuscularly daily until a toxic or pronounced hematologic reaction occurred. Medication was then discontinued and maintenance dosage resumed when the toxic reaction had subsided Daily doses were aminopterin, 1 to 4 mg.; amethopterin, 2 to 5 mg; amino-an-fol, 25 mg to 75 mg, a-minopterin, 5 to 15 mg. Maintenance therapy was given either daily or every other day and either intramuscularly or orally Ordinarily one mg tablets were used for oral aminopterin therapy, oral medication proving equally as effective as parenteral

Remission occurred in about one-third of the patients Toxic reactions,—ulcerative, mucosal and tongue lesions, nausea, burning sensation in the upper abdomen, diarrhea and a form of purpura were frequent Amethopterin and amino-an-fol are less toxic but also less effective in inducing a remission. It appears necessary to reach the level of toxicity to obtain a remission, but the margin of safety between a toxic reaction and death is at times very small.

Ganglion Blocking Agents

Tetraethylammonium Chloride—It is ganglion blocking agent available for clinical use, principally in the treatment of peripheral vascular disease and for relief of pain of angina pectoris and peptic ulcer. Berry et al (1946) recommend it in the treatment of Buerger's disease, Raynaud's disease, thrombophlebitis and causalgia Etamon has been used in the treatment of hypertension but for this purpose it does not appear to be a very suitable drug Atkinson (1950), used it successfully in the treatment of angina pectoris Beneficial results were obtained in 25 out of 28 patients as demonstrated by fewer attacks and greater exercise tolerance. Binter and Rankin (1950) employed it with great success for relief of pain of peptic ulcer. This is understandable as the drug interrupts gastro-intestinal motility and diminishes the volume and acid content of gastric secretion. Both epinephrin and neostigmine are useful

in controlling unpleasant or excessive vascular actions of etamon The dose is 500 mg intramuscularly every 12 hours

Pentamethonium (C_5) *and Hexamethonium* (C_6)—Paton and Zaimis (1948) showed that these compounds block transmission in autonomic ganglia The action is similar to that of TEAC but is stronger, lasts longer and is more selective since doses which cause a profound fall of blood pressure have relatively very little effect on accommodation or the motility of the bladder or the gastro-intestinal tract

The principal use for the methonium salts has been in the control of hypertension Smirk and Alstad (1951) treated 150 cases of all types of hypertension successfully with methonium salts Blood pressure fell considerably in most patients and the degree of fall was proportional to the height of the initial pressure Headache was relieved in almost all patients and retinal changes particularly papilledema regressed Signs of heart failure, dyspnea, anginal pain and nose bleeds improved and the size of the heart was reduced Some patients showed no symptoms from reduction of blood pressure but others felt faint at first, even if blood pressure was still above normal Hexamethonium salts were found more effective than pentamethonium salts Freis (1951) treated 15 patients and obtained remission in 11 ; the other 4 had advanced renal failure which progressed, although the blood pressure was reduced Average initial dose was 10 mg administered subcutaneously although after several weeks of therapy the average effective dose was 35 mg Injections were given at intervals of 12 hours ; in some cases 8 hour schedule was more satisfactory Oral administration was found disappointing A low sodium diet increased the effectiveness of C_6 Scott et al. (1950) used hexamethonium bromide in the treatment of duodenal ulcer with moderate success

Gantrisin

This sulfonamide is characterized by comparatively high solubility even in neutral and slightly acid body fluids , its solubility in urine increases from 60 mg per 100 c c at pH 5 4 to 327 mg per 100 c c at pH 6 14 Brickhouse et al (1949) treated 142 patients suffering from different diseases with gantrisin and encountered gross hematuria in only one case Svec et al (1950) state that gantrisin is a useful and relatively safe sulfonamide Caroll et al (1950) have found gantrisin effective in the treatment of urinary infections, especially when these are due to proteus, escherichia coli, or alcaligenes organisms The initial dose is 4 to 6 Gm. depending upon body weight, followed by 1 to 2 Gm every 4 hours day and night until the temperature has been normal for 3 to 7 days or until urine cultures have been sterile for several days

Gelatine Sponge (Absorbable)

Correll and Wise (1945) described a gelatine sponge made by foaming a solution of partially denatured gelatine with air and then drying the foam in an oven, which was hemostatic when applied to bleeding surfaces or wounds The hemostatic effect depends in part on its action as a tampon and in part on liberation of thromboplastin from damaged platelets Following application to

bleeding tissue it undergoes enzymatic digestion as healing progresses and is completely absorbed in from two to four weeks

Glucoronic Acid

Glucoronic acid is a component of polysaccharides of various plant gums, such as gum arabic, and also comprises part of the composition of connective tissue and collagen, particularly the cartilage, periosteum, nerve sheath, joint capsule, tendon and synovial fluid It occurs also in inter-cellular cement substance and in the walls of blood-vessels. It plays an important role in detoxication mechanisms and many toxic substances are eliminated as conjugates of glucuronic acid. Hodas et al (1949) used it in the treatment of rheumatic diseases Best results were obtained in patients suffering from osteo-arthritis, least favourable in those with rheumatoid arthritis. The dose recommended is 0 65 to 1 Gm three or four times daily, given as a syrup, or in tablets or capsules. The side effects include flushing of face and diarrhea or gastric upset which abate promptly on reduction of dosage or cessation of therapy.

Glutamic Acid Hydrochloride

Glu tamic acid is the sulfuric acid hydrolysate of wheat gluten and is present in practically all proteins It has attracted great attention during recent years because of the claim by Zimmerman et al (1947) that it improves the intelligence of children and adolescents of subnormal mental status In a study of 69 children and adolescents with a history of convulsive or both, increases in intelligence quotients of 8 to 11 points while taking glutamic acid were observed The dose recommended is 6-24 Gm daily, average dose being 12 Gm

Hetrazan

Following the observation that this compound is effective against microfilariæ in cotton rats, hetrazan has been used with benefit in the treatment of filariasis due to Wuchereria bancrofti and Loa Loa The doses employed by various investigators range between 2 to 6 mg /kg body weight daily for 7-21 days

Etheldorf and Crawford (1950) used the dihydrogen citrate salt of hetrazan for treating ascariasis in children. They found that 6 mg /kg. body weight given 3 times daily for at least a week effective in removing ascarids without use of a purgative or resort to fasting Side effects of hetrazan include headache, vomiting, pain in the abdomen and shortness of breath. These are generally not sufficiently severe to require discontinuation of treatment

Hexochlorophene

Unlike monophenol type germicides soap does not have a pronounced inhibitory effect on the germicidal action of hexachlorophene or compound G-11. Consequently the compound has been incorporated in soaps for scrubbing hands and arms before surgical procedures by the surgeons Seastone and Erickson (1949) recommend a liquid soap containing 1 per cent. hexachlorophene in a 20 per cent solution of potash soap for this purpose.

Hyaluronidase

Hyaluronidase is the enzyme which hydrolyzes hyaluronic acid—a viscous mucopolysaccharide found in the interstitial substance of connective tissue, the highest concentration occurring in synovial fluid and skin It has been identified with the "spreading factor" of Duran-Reynals, and may be prepared from bovine testes by fractionation with ammonium sulfate Hyaluronidase increases the rate of absorption of fluids administered by hypodermoclysis from 5-14 fold Pain from tissue distension due to clysis is prevented or diminished It is effective with all the commonly used fluids for hypodermoclysis including plasma but is inactivated by whole blood Infiltration and nerve block anesthesia are facilitated by the addition of hyaluronidase to the anesthetic. It has also been used in excretory urography in children in whom the contrast medium combined with hyaluronidase may be given subcutaneously The potency is stated in turbidity reducing or viscosity reducing units and the enzyme is inactivated by heat, ultraviolet radiation, trypsin and pepsin It is available as Hydase (Weyeth) and Alidase (Searle)

Hydrillin

Hydrillin (Searle) is a combination of diphenhydramine 25 mg and aminophylline 100 mg per tablet. One or two tablets 2 or 3 times daily have been recommended in the treatment of asthma.

Isonicotinic Acid Hydrazide

(Rimifon, Nydrazid, Marsilid)

Hydrazine derivatives of nicotinic acid have been found to be of value in the experimental tuberculosis of animals Robitzek and Selikoff (1952) used Rimifon and Marsilid in 44 human cases of acute febrile caseous-pneumonic tuberculosis Therapy ranged from 4-15 weeks All patients experienced rapid and marked reversal of their original toxic states, as evidenced by gain in weight, return of appetite, defervescence, and a sharp return in sense of well being.

Cough and expectoration have been eliminated or markedly reduced

Sputum bacillary contents have been reduced in 38 cases and, in 8 cases, examinations for acid-fast bacilli on stained smears have been repeatedly negative

On roentgenographic examination, reduction in cavity size has occurred in 17 cases and apparent diminution in exudate has occurred in 5 cases

Therapeutic effects of isonicotinic acid hydrazide (Rimifon) after four weeks at 4 mg per kg daily are roughly equivalent to 1-isonicotinyl-2-isopropyl hydrazine (Marsilid) at the same dosage and for the same period

The incidence of early side reactions is moderately higher with the isopropyl derivative (Marsilid) therapy at comparable dosages although, from tentative and preliminary animal studies, isonicotinic acid hydrazide (Rimifon) might have a higher potential delayed toxicity.

The hydrazine derivatives of isonicotinic acid exert an impressive therapeutic effect upon the course of acute caseous-pneumonic tuberculosis in humans.

Itrumil

Itrumil is the sodium salt of 5-iodo-2-thiouracil This compound not only inhibits the formation and/or secretion of thyroxine and thyroglobulin but also the activity of thyrotropin The advantages claimed for this new anti-thyroid compound are

(a) Effective anti-thyroid effect practically without goitrogenic effect,

(b) Vascularity and friability of the hyperplastic gland are reduced, thereby facilitating thyroidectomy and decreasing operative risk;

(c) No additional iodine therapy is required;

(d) The incidence of side effects is lower than with any other drug of the thiouracil group ;

(e) Hypothyroidism is not produced by prolonged therapeutic doses The drug is marketed by Ciba

Khellin (Visammin)

Khellin is the active principle of ammi-visnaga, a plant which grows wild in Eastern Mediterranean countries Decoctions of its seed have been used by the local population as an anti-spasmodic since ancient times Anrep et al. (1949) used it in the treatment of 250 patients suffering from angina pectoris and 50 patients suffering from coronary thrombosis Of the 250 patients with angina pectoris, 56 per cent showed good improvement, 34 per cent moderate improvement Ten per cent did not respond. Among the 50 patients with recent coronary thrombosis treated with khellin, the drug relieved and controlled anginal attacks which followed thrombosis during the period of bed rest as well as after recovery in 21 patients who had such attacks Mortality rate in the khellin treated group was similar to that in a control group The dose is 1 or 2 c c of a liquid extract containing 50 mg c c administered once or twice a day Compared with aminophyllin the vasodilator action of khellin is more prolonged.

The Egyptian claims for this drug are not being confirmed by workers in America.

Kwell

One per cent gammexane in vanishing cream was used as a scabieticide in 93 patients by Woolridge et al (1949) Eighty-seven of the 93 were cured with a single 24 hour period of treatment. Mobbs (1948), however, reports that in the South (U S A) where gammexane has been extensively used to fight the boll weevil, there have been reports of convulsive death in cows, pigs mules, dogs, chickens and rabbits The convulsive death of a child was suspiciously connected with inhalation of the agent

Miracil D (Nilodin)

Miracil D is a useful and effective drug for cure of urinary bilharziasis. Watson, Pringle and Abdel Karim Jalil (1951) claim a 96 per cent cure rate after oral use of the drug. The dose recommended is 10 mg./kg. body weight daily in divided doses for a period of five days. The side effects include nausea, vomiting, abdominal pain, yellow staining of the skin, insomnia, headache, giddiness, vertigo, excessive sweating, tremor and twitching.

Narakon

Narakon is a slightly acid, isotonic, aromatized, buffered solution containing benzal konium chloride (1 : 3,500) and allantion, for use when an antiseptic, detergent, palliative solution without immediate vasoconstrictive but with gradual decongestive action is indicated. The preparation is also supplied with added recemic desoxyephedrine (1 per cent.) for use when potent but rebound free shrinkage is desired. Drops, sprays and tampons are equally successful. The drug is of particular value in refractory and persistent blocking of the airways, in sinusitis and rhinitis medicamentosa.

Necroton

Necroton is an anti-toxic principle from the liver used in the treatment of hepatobiliary diseases. It was first prepared in 1926 in Japan and has since been made by workers in U.S.A. and South America. The extract is injected i.m. and the daily dose is 3 c.c. Favourable results are claimed in the treatment of toxic jaundice. In obstructive jaundice results were less striking. In cirrhosis there was obvious but not always marked improvement. Claims as to its therapeutic efficacy, however, still await confirmation.

Neobacin

Neobacin is a combination of 10,000 units of neomycin and 2,000 units of bacitracin per tablet and has been used in the treatment of infatile diarrhea due to infection with gram-positive and gram-negative cocci and bacilli, larger viruses and E. histolytica. The dose recommended is one tablet every 6 hours. The average duration of diarrhea on neomycin therapy was 2.8 days and the treatment succeeded after failure of sulfadiazene, streptomycin or penicillin alone or in combination.

Niacin-Triethanolamine

Bohumil Prusik (1949) found a 3 per cent solution of triethanolamine of niacin the most successful agent among different vasodilating agents studied. Good results were achieved in thromboangitis obliterans, diabetic obliterating endarteritis, acrocyanosis and Raynaud's disease. The injections are made i.v. and 5 c.c. injected on the first day, 10 c.c. on the second and if no untoward reactions occur (deep flushing and rise of skin temperature by 2 to 3°C is normal), 20 c.c. on the third and subsequent days for 20 to 40 injections.

Nitrogen Mustards

There has been considerable interest recently in the nitrogen mustards which are *relatives of* mustard gas, in the treatment of leukemias, Hodgkin's disease, polycythemia vera *and malignant* conditions The compounds most extensively studied are *methyl-bis* (*B*-chloroethyl) amine HN_2, ethyl bis (B-chloroethyl) amine (NH_1), and tris (B-chloroethyl) amine (NH_3)

The *action* of nitrogen mustards on proliferative cells is of special interest. In sublethal doses this effect is one of a specific cytotoxic character and the *pathological* changes in tissue cells are uniquely confined to the gastro-intestinal *mucosa* and the blood-forming organs The gastro-intestinal effects are nausea, vomiting and severe diarrhea ; the hemotologic ones, lymphopenia, eosinopenia granulopenia, thrombopenia and a moderate anemia.

Nitrogen mustards are of particular value in the treatment of Hodgkin's disease. It is of especial value in severe cases with marked constitutional symptoms. It also resensitizes to X-ray therapy those cases that have becom refractory. The dose recommended is 0 1 mg /kg. intravenously on four suc cessive days

Benefit also occurred in lymphosarcoma and lymphoid leukemia In fa advanced multiple myeloma, myeloid leukemia and metastatic carcinoma n significant benefit followed the treatment. Remissions of 6 months to 2½ year have been produced in polycythemia vera The fact that nitrogen mustar causes lymphopenia and eosinopenia led C. Jimenez-Diaz et al. (1950) to ad minister it in conditions in which ACTH and cortisone have been known to b effective. Fourteen patients suffering from rheumatoid arthritis wer administered HN_2 intravenously in doses of 0 1 mg /kg. body weight every othe day for four or five injections All showed definite improvement and in cases the result was striking.

Six patients suffering from bronchial asthma, four of whom had statu *asthmaticus* resistant to all therapy were treated with HN_2. One patien who was ill for several months obtained complete and permanent relief Th others had significant though less dramatic benefit.

Parasympatholytic Drugs

Parasympatholytic drugs are used in *therapeutics* for their neurotrop and musculotropic spasmolytic action. The older ones include atropine *hyoscine*, apoatropine and homatropine methylbromide. The more recen ones include trasentin, syntropan, pavatrine, amethone, parpanit, diparco banthine and artane

Trasentin, syntropan and pavatrine are used in the treatment of peptic ulce and gastro-intestinal hypermotility. Their mydriatic, anti-sialogogue an anti-cholinergic activity as measured on the blood pressure of cat, seems insign*ficant as* compared with that of atropine.

Amethone—Amethone is spasmolytic to plain muscle of many organs but its particular usefulness is for prophylaxis and treatment of colic caused by spasticity of the smooth muscle of renal pelvis, ureter, and urinary bladder. The dose is 50 to 100 mg every 3 hours

Parpanit, Diparcol, Lysivane and Artane—These drugs are useful in the treatment of Parkinsonism The drugs principally control the muscular rigidity of this disease Hartman (1947) found parpanit superior to atropine in the treatment of this disease. Parpanit is less toxic than diparcol Doshay and Constable (1949) found artane superior to parpanit and belladonna in the treatment of Parkinsonism. All these drugs possess atropine-like activity and in addition as Bovet has shown depress ganglionic transmission

Banthine—Banthine is a quaternary ammonium compound with both an atropine like action on the effector organs of the parasympathetic and a blocking effect on the autonomic ganglia Both effects are anti-cholinergic, and serve to combat the vagotonia characteristic of the peptic ulcer Longino et al (1950) reported a marked decrease in gastric and intestinal motility following administration of 100 mg of banthine bromide orally Longino et al and Grimson and Lyons (1950) reported relief from pain within 15 minutes of taking of the drug Patients with duodenal ulcers perforated into the pancreas, showed healing after several weeks of treatment Patients with stoma ulcer and duodenal ulcer with several massive hemorrhages before treatment, did not bleed after treatment with banthine was instituted The drug is marketed by Searle and the dose is 50-100 mg The side effects include dryness of the mouth blurring of vision and some difficulty in emptying the bladder particularly in elderly patients with prostatic hypertrophy

Parasympathomimetic Drugs

The older parasympathomimetic drugs include acetylcholine, mecholyl, carbachol, pilocarpine, muscarine and the reversible anti-cholinestrase drugs, physostigmine and neostigmine Evaluation of furmethide, and the irreversible anti-cholinesterase drugs diisopropylflourophosphate (DFP), tetraethylpyrophosphate (TEPP) and octamethylpyrophosphoramide (OMPA) continues

DFP is the most powerful miotic known and may find a permanent place in the armament of the oculist in the treatment of glaucoma Its use in myasthenia gravis has been disappointing as its effects are not so dependable as those of neostigmine

The anti-cholinestrase activity of TEPP like that of DFP is more prolonged than that of neostigmine It is given in doses of 15 mg daily in three divided doses The maximum effects of TEPP last for 12 hours The drug seldom produces abdominal cramps but the margin of safety between the dose producing cessation of symptoms and the dose eliciting toxic symptoms is small Stone and Rider (1949) feel that in some cases not adequately controlled by neostigmine the drug is definitely superior to neostigmine

Octamethylpyrophosphate (OMPA) acts selectively on peripheral cholinestrase and has advantages over TEPP in that it is more stable and its toxicity can be reduced by atropine. The initial dose is 7 mg with increments of 1 mg every 1-3 days, based on rate of fall of serum and red cell cholinestrase levels, until maximal benefits are obtained Maintenance dose is 9-18 mg twice daily OMPA is smooth and sustained in its effect.

pHisoderm

pHisoderm combined with hexachlorophene is recommended for pre-operative sterilization of both operative field and hands of operating personnel. A two-minute scrub with this combination of detergent and antiseptic is at least equivalent to the routine ten-minute surgical scrub.

Pituitrin

(Intravenous)

Trimble and Wood (1950) discuss the treatment of pulmonary hemorrhage by intravenous pituitrin The drug was used 46 times in 32 patients always with prompt response Ten i u of pituitrin in 10 c c normal saline is slowly injected into the vein over a period of 10 minutes, with the patient supine Slightly after commencement of injection, intense pallor is noted and the patient may complain of dizziness. This may be followed by slight abdominal cramps and an urge to defecate and pass water Nausea is common These effects are transitory and soon disappear

Post-Partum Plasma

Post-partum plasma has been employed in the treatment of rheumatoid arthritis The plasma was taken from mothers 48 hours after child-birth and administered to seven patients who had been crippled, some hopelessly so, for years As a result of this therapy, the patients were able to go through a series of calisthenics including rope jumping The improvement after treatment with post-partum plasma is long lasting (24 months) in contrast to ACTH or cortisone in which effects wear off in several days or weeks. It is inexpensive and available

Primaquine

Primaquine is a new anti-malarial related chemically to pamaquine It has been reported upon favourably by Edgcomb et al (1950) in experimentally induced malaria in volunteers At the time of this writing (1952) it is believed to be the most effective drug in the treatment of malarial relapses Best results are obtained when it is given in combination with quinine for a period of 14 days. The toxicity is low and ten times the curative dose can be given without any fatality

Prisildene Hydrochloride

(Hoffman-Laroche)

Smith and Nagyfy (1949) found subcutaneous administration of Nisentil hydrochloride to produce good analgesia during labour more frequently than

did methadone hydrochloride, morphine, or combinations of morphine with neostigmine or scopolamine The recommended dose is 10 mg subcutaneously at intervals of 2 hours or more, the last dose should be given 2 hours or more prior to delivery. Not more than four doses should be given to guard against failure of fetal respiration.

Pyromen

Randolph and Rollins (1950) used pyromen in the treatment of 150 cases of allergic disorders It was found less effective in controlling inhalant symptoms than symptoms of food allergy Patients allergic to house dust, silk, etc, obtained greater relief if specific inhalant therapy was combined with pyromen Pyromen exerts its beneficial effects by stimulating the pituitary adrenal system and although it is inferior to ACTH and cortisone it is a promising agent in the treatment of chronic allergic disorders

The initial dose is 1-2 mg pyromen in saline given intravenously and causes a relief in symptoms for about 12-18 hours A second dose, usually 48 hours after the first and about 50 per cent greater if the initial response is not satisfactory, may produce an effect in 48-72 hours Thereafter doses are given at intervals of days or weeks as required As time goes on an attempt is made to lower dosage in order to get continuing effect Oral dosage is continued to hold the gains obtained from intravenous therapy A solution containing 5 mg/c c in saline is held in the mouth for about 5 minutes before swallowing

Radio-isotopes

All elements have three essential constituents—the protons and neutrons in the nucleus and electrons which surround the nucleus The protons carry positive charge and electrons the opposite negative charge, the neutrons are neutral The atomic weight of an element is dependent upon the protons and neutrons that it has; but its atomic number and hence its chemical properties depend upon the peripheral electrons (which equal the number of protons in the nucleus) It is now clear that the alteration in the number of neutrons will not alter the charge of protons or the electrons and hence such a change will not alter the atomic number or the chemical properties of that element though the atomic weight can be changed Such substances are isotopes and when they are artificially prepared by bombardment of teleurium in the atomic pile they are radio-active These are unstable and disintegrate with emission of various types of radiations which differs with different elements The rate of disintegration varies and the HALF-LIFE of an element is the time required for a sample to decay to one-half its original activity These are known For any element to be useful for practical purposes the half-life should neither be too short (i e, seconds) nor too long (years)

Tracer-technic—Substance whose action is being investigated in the body or an isolated tissue, is marked or tagged with a radio-active isotope which acts as a "tracer" and can be detected in the body by the radiation which it emits

Detection—The main method of measuring radiation is by the use of Geiger-Muller counters These have a chamber containing gaseous media in which radiation produces ionization and the ionization facilitates the passage of electric current which can be counted by a counting device.

There are several uses for radio-isotopes in medicine such as tracing an element in the body, indentification of a compound in which the traced element is combined, indentification of stages in a series of biochemical processes, in diagnosis, and in therapy.

Radio-isotopes have shown great value in diagnosis Radio-sodium chloride ($Na_{24}Cl$) is injected intravenously in order to better study congestive heart failure, limitations of blood flow in ischemic areas and to measure the water content of the body Radio-strontium has shown possible value in diagnosis of diseases of the bones and teeth and tumours because it is deposited in the hard tissues of the body Radio-carbon is employed similarly. Sodium radio-iodide NaI_{31}, is of value in thyroid disease, particularly in malignancy with metastases The patient suffering from thyroid cancer is instructed to go on a diet with low iodine content for a period of time Following this small tracer doses of radio-active iodine are administered and a Geiger counter used to determine whether the cancerous thyroid tissue will pick up the radio-iodine. If it does pick it up, radio-therapy is indicated Radio-cobalt, radio-iron and radio-phosphorus, all show possible value in diagnosis Radio-active lysine is being used as a tracer and its course followed through the body because it is believed to have some role in cancer.

The radio-active substances also show great promise in the treatment of disease Radio-phosphorous or P_{32} has been found to be very effective in the treatment of polycythemia vera and is probably the best agent for this disease. A course consists of two injections of 3-6 mc and the remission lasts 2-3 years. P_{32} has also been employed with benefit in the treatment of chronic leukemia. In acute leukemia the results are disappointing In the treatment of skin cancer encouraging results have been obtained by Low-Beer. Radio-active iodine has shown good results in the treatment of thyrotoxicosis and some forms of thyroid cancer Radio-active sodium has helped to save the legs of some 500 diabetic patients threatened with gangrene Paul Hahn has found radio-manganese and radio-gold exceedingly useful in the treatment of 108 patients with chronic leukemia, lymphoma and Hodgkin's disease Radio-gold has given encouraging results in the treatment of cervical and ovarian cancer

Roniacol Tartarate

(Hoffman-LaRoche)

It is a primary alcohol derived from nicotinic acid and is an effective vasodilator. It is useful in Raynaud's disease, Buerger's disease, end arteritis, intermittent claudication, ulcerated varicose veins, decubitus ulcers, acrocyanosis, chilblains, migraine associated with vascular spasm, Meniere's syndrome and ophthalmic conditions associated with deficient blood supply. The dose is 50-200 mg orally 3 or 4 times daily. The drug is available in 50 mg tablets.

Salicylanilide

Long used as a fungicide in textile industry, it has been found very effective in ringworm of the scalp due to M audouinæ. A 5 per cent ointment in a base of carbowax was found to cure 75 per cent of 27 cases (Haber et al. 1949) following daily application for periods of 3 to 16 weeks

Salicylamide

It is a new analgesic claimed to possess more than seven times the analgesic potency of aspirin The drug besides being effective as an analgesic and antipyretic is well tolerated and digestive disturbances and dizziness have not been encountered

Selenium Disulfide

(Selsun—Abbot)

A suspension of selenium disulfide has been found to be of great value in the treatment of seborrheic dermatitis (dandruff) of the scalp

Streptokinase and Streptodornase

(Varidase—Lederle)

Miller et al (1951) used a lederle preparation containing 200,000 units of streptokinase and 300,000 units of streptodornase ampoule in the topical treatment of various infectious processes Their results are summarized in the following table.

Diseases treated	Patients	Results	
		Excellent	Poor
Actinomycosis	1	1	.
Decubitus ulcers	3	3	...
Empyema	3	3	...
Gangrene	4	1	3
Hemothorax	6	6	...
Infected amputation stumps	3	3	. .
Osteomyelitis	4	3	1
Otitis media	1	1	. .
Pilonidal cysts with abscess	13	13	...
Rectal infections	10	10	...
Sinusitis	1	1	..
Soft tissue infections	27	26	1
Tuberculosis	9	9	...
TOTAL	85	80	5

Detection—The main method of measuring radiation is by the use of Geiger-Muller counters These have a chamber containing gaseous media in which radiation produces ionization and the ionization facilitates the passage of electric current which can be counted by a counting device.

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Thiomerin (Mercaptomerin)

Organic mercurials in common use produce direct toxic action on the heart and consequent conduction changes A-V dissociation, interventricular blocks, broadening of the Q R. S complexes, ventricular tachycardia, fibrillation and standstill have been found In an attempt to find a less toxic mercurial diuretic, thiomerin was introduced which is mercuzanthin with mercaptan instead of theophylline

Herman and his associates (1949) used it in 100 cases subcutaneously and 50 intravenously with no serious reactions With this compound not only is cardiac toxicity decreased, but the amount of local irritation at the site of injection is lessened sufficiently to make subcutaneous injection relatively painless The dose is 2 c c subcutaneously and the injections may be given daily

Diuretic responses were not equal to those of other mercurials in the first 24 hours but usually were more persistent Ammonium chloride increased diuretic effectiveness of thiomerin so that 0 5 or 0 75 c c doses were often effective

Triethylene Melamine

Triethylene melamine (TEM) has therapeutic and toxic properties similar to the nitrogen mustards It differs from HN_2, the most commonly used nitrogen mustard in that it has greater activity by weight, and it does not produce central nervous system or cholinergic stimulation in animals In addition, it can be given orally TEM given orally in doses of 20 to 40 mg for three to five weeks has been found to produce temporary periods of improvement in 58 patients suffering from Hodgkin's disease, lymphosarcoma, chronic lymphatic and myelogenous leukemia and mycosis fungoides More studies are needed to determine its usefulness in carcinoma The drug is being investigated at present by Memorial Center for cancer and by Lederle Laboratories

Vitamin B_{12}

Vitamin B_{12} is a cobalt-containing substance usually produced by the growth of suitable microbial organisms or obtained from liver When administered parenterally it produces the same therapeutic result as does liver, in patients suffering from pernicious anemia Castle believes that vitamin B_{12} is identical with the extrinsic factor or the anti-anemic factor and that the role of the intrinsic factor which is present in normal gastric juice, is merely to aid the absorption of the vitamin B_{12} or the extrinsic factor Vitamin B_{12} not only corrects the hematological abnormality, it also alleviates the neurological symptoms and glossitis often present in this anemia Folic acid corrects only the anemia A failure to hydrolyze folic acid conjugates present in food has been postulated in these patients but not proved Therapy with vitamin B_{12} corrects the folic acid deficiency present in these patients The therapeutic effect of vitamin B_{12} in pernicious anemia is blocked by folic acid antagonists. Thymine (5-methyluracil) in doses of 12-15 Gm orally daily corrects the megaloblastic anemia in cases of primary pernicious anemia, nutritional macrocytic

Wounds were treated with nylon packs saturated with the solution or by injecting the solution (one or more ampoules) through a rubber dam placed over the wound and sealed to the skin with cement. Hemothorax and empyema were treated by repeated injections and aspirations with a needle or preferably insertion of a No 20F catheter. After the enzymes are injected, the catheter is clamped for 8 hours and then unclamped till next treatment for drainage

Subdamine

(1-diethylcarbamyl-piperazine)

Subdamine (1-diethylcarbamyl-piperazine) is an effective sedative in conditions with increased tension, restlessness and excitability. The dose is 0 3-2 Gm daily in three or four divided doses

Sympathomimetic Amines

Aleudrin—This drug is isopropyl epinephrin and is variously known as aludrine, isorenin, isonorin, isuprel, norisodrine and IPA It shares with epinephrin the ability to produce tachycardia and its bronchodilating potentiality is perhaps greater than that of epinephrin

It is used in the form of sublinguets 10 mg and as a mist of 1 in 200 in hand nebulizers It is not practicable to administer aludrine by mouth or subcutaneously because of high incidence of side effects. tachycardia, rise in systolic and fall in diastolic blood pressures, symptomatic and EKG evidence of coronary insufficiency Inhalation of nebulized aludrine appeared to produce the best therapeutic effects and lowest incidence of untoward reactions Aludrine mist exerts significant local bronchodilating effect, and too little enters the circulation to produce systemic toxic effects An important and unexpected effect of aludrine inhalation is a decided increase in expectoration in case of chronic infective (intrinsic) asthma The drug has been found to be of value in the treatment of status asthmaticus Krasno et al have used norisodrine sulfate dust from small pocket inhalers with success

Orthoxine—See page 146

Synhexyl

Synhexyl is being investigated to counteract depression in old age and psychiatric patients The effective dose in depressed patients is 60 to 90 mg In narcotic addicts doses of 60 to 240 mg. may be given three times a day by mouth without ill effects

Tensilon Chloride

(3–hydroxy–phenyl) dimethyl ethyl ammonium chloride

It is a potent antagonist for d-tubocurarine, flaxedil and dimethyl tubocurarine (metubine or mecostrin) but is ineffective against syncurine and mytolon It acts within half to one minute and is indicated when it is desired to terminate the action of curare or in case of overdosage.

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anemia and sprue (Spies et al 1948) Like folic acid, thymine has no beneficial effect in postero-lateral sclerosis Injection of a very small amount of vitamin B_{12} into the bone marrow cavity of a patient with megaloblastic reaction is followed in a few hours by transformation to a normoblastic state in the part injected but not in other parts of the body. Vitamin B_{12} is effective regardless of its source, whether from liver or streptomyces griseus It is particularly useful in patients who are allergic to injections of liver extract

In macrocytic anemias of infants, pregnancy, certain cases of sprue and tropical macrocytic anemias, vitamin B_{12} like liver injections is often only partially effective and larger doses are required to produce an adequate therapeutic effect Folic acid on the contrary is effective in nearly all of these conditions and may be administered by mouth Neurological abnormalities are rarely encountered in these macrocytic anemias.

The biochemical lesion in the macrocytic anemias is at the present time not elucidated but animal and bacterial studies have shown that both vitamin B_{12} and folic acid are essential to normal nutrition and that the synthesis of nucleoprotein and the conversion of choline or cysteine to methionine fails in their absence

Vitamin B_{12} has been found to give striking improvement in patients suffering from diabetic neuropathy. Wetzel et al (1949) found that undernourished children grew much more rapidly on a good diet if vitamin B_{12} was added.

It appears that vitamin B_{12} has an even greater role than its therapeutic action in the megaloblastic anemias indicates In nutritional studies an unindentified factor present in animal protein but not present in yeast or seed proteins has been found necessary for normal growth and probably for maintenance of life This factor (APF) has been found in liver, cow manure and fish products but not in vegetable protein diets The animal protein factor (APF) has been found to be essential for many animal species including chicken, pigs, rats and mice It is of tremendous significance to the poultry and animal husbandry industries and the possibility that vitamin B_{12} may be the APF is of great importance

The dose of vitamin B_{12} is 15 to 25 mg once or twice a week until remission occurs and thereafter 15 mg fotnightly. If neurological symptoms are present the dose is 10 mg. daily or on alternate days for 3-6 months and thereafter 10-30 mg weekly Vitamin B_{12} in large doses 30-900 mg weekly for several weeks intramuscularly has also been found valuable in the treatment of osteoarthritis and osteoporosis.

Xenon

It is an inert gas employed to produce purple color in advertising signs. A new use has been found for it in surgical anesthesia. It appears to be safer than most anesthetic gases during administration because there is no danger of explosion and fire The induction and recovery are rapid and there are no ill effects.

PART II

CHAPTER VI

INFECTIOUS DISEASES

I

GENERAL MANAGEMENT OF FEVERS

Rest—The patient should be confined to bed in a strictly recumbent position as long as temperature remains elevated The bed should be single and the mattress firm; in prolonged fevers sponge-rubber or air mattress is preferable Bed clothes should be light and comfortable The bed should be so placed that the patient is accessible from both sides, out of direct draught and not directly facing window or other bright light The ideal sick room is large, quiet, airy, bright and well ventilated It should have a minimum of furniture, hangings, etc., and should have an attached bath-room

Nursing—Skilled nursing is most important Overalls should be kept in sick room for use by attendant and physician A bowl of disinfectant lotion such as dettol or lysol should be available for hands The skin should be kept clean by sponging with soap and water and the windows kept closed during the process Talcum powder must be dusted freely after the sponge The patient's position must be frequently changed Food should be given at regular hours Cold drinks should be given *ad lib* and frequently Mouth should be cleansed after each meal in young children by cotton wool soaked in warm water on an index finger, in older children and adults, a tooth brush should be used Lips should be smeared with vaseline Nasal discharge should be removed on rags or paper handkerchiefs which should be burnt. Nostrils should be kept clean and smeared with vaseline Eyes may require regular cleaning

Excreta is removed from the sick room and disposed into the closet quickly. Soiled articles must be disinfected. Swabs should be burnt Food and drink should be kept covered and protected from flies

Fresh Air—Free ventilation is essential It has tonic value, induces sleep and restfulness If necessary, warmth may be maintained by extra light blankets

Diet—In short fevers diet should be restricted to fluids One and one-half to three pints of milk should be given daily in feeds of 5 to 6 ounces Milk may be boiled, citrated, peptonized, flavoured with tea or coffee or ovaltine and given hot or cold. Lemon juice or orange juice sweetened with glucose or sherbet may be allowed, 5 to 10 ounces of glucose may be given in 24 hours Albumin water, barley water, lemon barley, fruit juices, clear soups, custards and jellies may be given Commercial meat extracts have little to recommend them. Feeds should be given 2-hourly by day and 4-hourly by night Water and juices should be given freely. In fevers of long duration, diet should be liberal as in typhoid fever.

Treatment of Symptoms

Pyrexia—Unless it is high no active treatment is called for. In mild cases a diaphoretic mixture is ordered ·

R	Pot. Cit.	gr. 20
	Liq Ammon. Acetat.	dr. 2
	Spt. Eth Nit.	m. 20
	Aq. ad.	oz. 1

When temperature exceeds 102°F an ice cap, sponging with tepid water, cold water or even alcohol should be employed Hyperpyrexia is controlled by cold pack or cold baths, treatment should stop when temperature falls to 102°F. Amidopyrin, phenacetin, aspirin, etc., should not be given for lowering temperature

Headache and Malaise—Aspirin gr 7½ or phenacetin gr. 7½ or a tablet of Saridon or Optalidon give relief In infections of C. N S puncture gives prompt relief

Insomnia—General measures such as cold to the head, sponging, forcing of fluids and glucose, must be attended to If more is necessary one of the following may be given Medinal 1 tablet; adalin gr. 10 to 15 at bed time; chloral hydrate gr 15, pot bromide gr. 20, syrup aurantii dr 1 and water up to one ounce Paraldehyde is another excellent and safe hypnotic:

R	Paraldehyde	dr. 2
	Syrup Aurantii	dr 2
	Aq. ad.	oz. 1

If sleeplessness is due to pain, ¼ grain of morphine should be given hypodermically.

Delirium—Measures to reduce temperature and toxemia reduce also delirium. Ice cap, cold sponging, forced fluids, dextrose, etc In mild cases bromides are of value, in severe cases morphine may be given. In cases with maniacal excitement ¼ gr morphine combined with hyoscine hydrobromide gr. 1/100 is of value

Nausea and Vomiting—Mild cases respond to a mild purgative and restriction of food to iced glucose, lemonade or fruit juice Pieces of ice may be sucked A powder of 10 grains each of Sod. Bicarb. and Bism Carb suspended in water and given 4-hourly often helps Other measures are · Rectified tincture of iodine in one minimum doses hourly, mustard plaster to the epigastrium or calomel in fractional doses combined with sodium bicarbonate. Persistent cases should be given 5 per cent glucose in normal saline intravenously

Constipation—Initially calomel gr 2 to 3 at bed time should be followed in the morning by a dose of saline In children milk of magnesia half ounce is suitable. Later on liquid paraffin or compound liquorice powder are preferable.. A cleansing enema on alternate days is often required in severe infections

Anthrax

The disease is confined to workers with animals or in wool, hair or hides; infected shaving brushes have been responsible in a few others. It is either cutaneous, "malignant pustule," or occasionally gastro-intestinal, or pulmonary due to inhaled spores; latter forms are invariably fatal in 3 or 4 days.

The patient should be confined to bed. If constitutional symptoms are present, treatment as for general febrile conditions should be applied.

The pustule should be dressed with gauze soaked in eusol or 2 per cent formalin lotion. Excision should not be performed.

The drug of choice is penicillin. The injections are given intramuscularly and the dose recommended is 250,000 units 4 hourly day and night. In severe infections and particularly in the pulmonary form the treatment has to be more intensive and combined treatment, with penicillin, sulfadiazine and sclavo's serum is recommended. Scalvo's serum is not always available and is required only for the severest forms. The dose recommended is 100 c.c. intravenously on the first day followed by 100 c.c. daily for a total of 300 to 600 c.c.

Cerebrospinal Fever

Most commonly encountered in children under 5 years, it also occurs in older children and young adults. The causal organism is N. meningitidis. It is spread by droplet infection through carriers, direct spread from one patient to another is unusual. During epidemics abortive and atypical cases are common. Important factors favouring its spread are overcrowding and insanitary conditions. In susceptible individuals the disease is carried from the nasopharynx to the meninges by blood stream. The incubation period is 2 to 7 days, commonly 3 to 5 days.

Treatment—Absolute rest in bed, quiet environment and skilled nursing essential. The eyes should be screened from bright light. The skin, mouth, and eyes require careful regular cleansing. Bowels must be kept open by ...ata or liquid paraffin. Diet, at first liquid, must be supplemented by soft ...s and later solids. In coma or dysphagia feeding has to be by the nasal ... Fluids should be pushed. Retention of urine is apt to occur and should ...eved by regular catheterization.

...ulfonamides—The drug of choice is sulfadiazine. Two grams combined ... equal quantity of sodium bicarbonate should be given 4-hourly for the ... hours day and night. After this 2 tablets or 1 Gm. should be given ... hours. In comatose patients the tablets should be crushed and ...ed in milk or water and given by nasal tube placed in the stomach ...vely sulfadiazine soluble should be given intramuscularly. An effort ... made to get back to oral route as quickly as possible.

...icillin—Another very effective agent is penicillin. It must be used by ...pinal route. The dose is 30,000 units once daily. In addition to the

intraspinal therapy, penicillin should also be injected intramuscularly in dose of 50,000 units every 3 hours day and night.

Prophylaxis—Overcrowding should be prevented and free ventilation emphasized Children must not share the same bed. They should avoid cinemas, theatres, parties or other assemblies Kissing of children should not be permitted Fatigue, chill and catarrhal infections should be avoided. Routine use of nasal douches and gargles is of doubtful value

Chicken Pox

It is a virus disease of high infectivity. Incubation period is 13 to 16 days, rarely less than 11 or more than 20 days Infectivity persists until last primary crust has separated from skin. There is no effective specific prophylaxis

Treatment—This is on general lines. The patient should be confined to bed The skin should be kept clean by warm sponging, dried gently and dusted over with talcum If there is itching, calamine lotion or 2 5 per cent phenol in olive oil should be applied. If there is tendency to scratch pocks, the hands should be wrapped in lint or gauze, or the arms lightly splinted In severe eruptions the skin should be painted with 1 per cent Condy's lotion The mouth, nose and eyes should be kept clean. The diet should be light at first but can be rapidly increased to normal

In case of secondary infection of skin lesions sulfonamides or penicillin should be given

Isolation should continue until the last primary crust has separated

Diphtheria

The incubation period is 2 to 4 days but may extend to seven days It is important to make a routine examination of the fauces in every case as early diagnosis is most important

Treatment—The patient should be confined to bed in a strictly recumbent position Owing to the risk of cardiovascular failure any attempt to sit up should be strictly forbidden Period of recumbency in bed should be in mild cases 14 days, in severe cases 8 weeks or longer. The diet should be fluid with addition of ice-cream and jellies Three to five ounces of glucose should be given as glucose lemonade daily. Food should be given 2 hourly in small quantities Mouth should be kept clean Hot fomentations should be applied to the neck if the cervical glands are swollen and painful Bowels should be kept open by enemata

Serum—4,000 units should be given at once to any child suspected of suffering from diphtheria Bacteriological examination should follow When the clinical picture is typical, bacteriological diagnosis should be ignored and serum given. Mild attacks should receive 2,000-8,000 units, moderately

severe 20,000 to 30,000 units and severe or toxic attacks 50,000 to 100,000 units of anti-toxin intravenously. In infections limited to larynx 10,000 units and in purely nasal diphtheria in the absence of severe toxemia 4,000 to 8,000 units may be enough. When treatment is delayed a larger dose is necessary The injection should never be given subcutaneously For intramuscular injections, middle third of the outer aspect of the thigh is suitable

Penicillin—Penicillin-procaine complex 300,000 units daily accelerates slightly the disappearance of the organisms from the throat and acts against secondary invaders but does not alter the course of diphtheria itself

Complications—Prevention of cardiovascular failure strict recumbency, early serum, glucose lemonade and glucose intravenously (200 c c of a 25 per cent solution) are important Once marked signs of cardiovascular weakness appear, little can be done The foot of the bed is raised, oral feeding stopped and replaced by rectal saline and intravenous glucose and drugs like caffeine sodium benzoate, coramine or cardiazol injected Digitalis and strophanthus are definitely contra-indicated

In palatal paralysis the fluid diet should be replaced by semi-solids In pharyngeal paralysis the foot of the bed should be raised 18 inches, the saliva and the mucous aspirated frequently and food given by the nasal tube On slightest sign of intercostal or diaphragmatic paralysis, the patient should be removed into a mechanical respirator

Convalescent period should be prolonged and an iron tonic prescribed

Prophylaxis—Susceptibility to diphtheria should be determined by Schick Test In the left forearm is injected intradermally 0 2 c c of diluted diphtheria toxin; into the right forearm is injected 0 2 c c of the control Reliable Schick Test and control material are available commercially An area of erythema 1 to 4 cm in diameter round the site of injection in 2 or 4 days indicates a positive Schick Immunity, passive or active, may be conferred upon the positive reactors Passive immunity is required for contacts of diphtheria patients by intramuscular injection of 1,000 units of diphtheria anti-toxin Immunity develops in 24 hours and lasts 3 weeks For active immunization APT (alum precipitated toxoid) is injected intramuscularly in two doses of 0 2 and 0 5 c c into the deltoid at an interval of 4 weeks, or FT (formol toxoid) in three 1 c c doses at intervals of 4 weeks or in children above 9 years TAF (toxoid anti-toxin floccules) in three 1 c c doses at 4 week intervals Eight weeks after immunization a "posterior Schick" or estimation of the anti-toxic content of blood is essential If Schick is still positive, active immunization should be repeated

Dysentry Bacillary

General Management—Complete rest in bed is essential In fulminating cases with continuous stools patients should be nursed on a mackintosh sheet packed with tow. In the absence of nausea or vomiting liquids such as tea or clear broths may be given at frequent intervals Milk is not recommended Feeds should be small and 2 hourly Eggs, toast, custards, well cooked cereals, puddings and similar foods are added as improvement occurs

A bland, low residue type of diet should be continued until recovery is complete

Sulfonamides—Sulfonamides are the agents of choice The best drug to use is sulfadiazine in doses of 1 Gm every 6 hours. It may be combined with 0 3 Gm. Dover's powder per dose for the first few doses. Sulfaguanidine and sulfasuxidine are also effective but the dosage has to be large. Sulfathalidine can be employed in half the dosage required for sulfasuxidine

Antibiotics—Penicillin is of no value Aureomycin and terramycin are said to be of use.

Serum—It must not be given in mild cases and those of moderate severity It promptly neutralizes the neurotropic toxin produced by Shigella Dysenteræ and probably is useful in only this type of infection

Castor Oil and Salines—Castor oil and saline cathartics or colonic irrigations are not required Abdominal discomfort may be relieved by local heat and atropine gr 1/120 orally or parenterally 2 or 3 times a day

Complications—The treatment of iritis and arthritis is on general lines.

Enteric Fever

General Management—Skilful nursing is of paramount importance Patient must be kept strictly recumbent but position should be altered several times in the day. Use of bed pan and bed urinal must be insisted upon Mental rest is as essential as physical rest and visitors must be excluded. The mouth and skin require frequent and careful cleansing

Diet—During early days diet should be fluid. Towards end of first week in addition to 2 pints of milk daily, such readily digestible articles as light boiled eggs, custard, rice, cream, junket, milk shakes, milk puddings, jellies, mashed potatoes with butter or gravy, thin bread and butter, sponge cake, etc, may be given Feeds should be small in quantity, eaten slowly, given frequently. Plain water, glucose orangeade, sherbet and fruit juices may be given liberally

Antibiotics—Chloromycetin in doses of 2 to 4 Gm. daily in divided doses is effective

Chloromycetin—The antibiotic is highly effective in the treatment of typhoid fever The dose recommended is 1 Gm every 8 hours for 5 days followed by a period of 5 days during which no chloromycetin is given This is followed by a second course of chloromycetin lasting another 5 days For children the dose is half The drug may be suspended in water or normal saline and administered by stomach tube Smadel et al (1951) recommend the combined use of cortisone and chloromycetin in the treatment of typhoid fever; chloromycetin is given in the usual dosage and in addition 300 mg. cortisone is given on the first day, 200 mg on the second day and 100 mg on the third day. The toxemia quickly disappears, the temperature becomes normal in a much shorter period than when chloromycetin alone is employed and the appetite improves

Treatment of Symptoms—Constipation. Purgatives must be avoided Liquid paraffin may be given at bed time and opening enemas used on alternate days

Diarrhea—Severe diarrhea will necessitate restrictions in the diet It may be necessary to replace milk by whey, lactose should be substituted for glucose An occasional dose of 5 grains of Dover's powder is often effective

Meteorism—The diet should be restricted as in diarrhea In severe meteorism diet should be restricted to whey, albumin water, cold meat juice Flatus tube or soft rubber catheter should be introduced into the rectum and left *in situ* for 20 minutes Other measures are use of turpentine stupes and a turpentine and soap water enema (½ ounce of turpentine to 1 pint of soap water)

Toxemia—Measures of value in combating toxemia are use of ice cap, cold sponging, cold water and glucose freely by mouth and glucose intravenously

Hemorrhage—The foot of the bed should be raised A ¼ grain dose of morphin should be promptly injected. When the effect begins to wear 5 grains Dover's powder should be given by mouth every 4 hours Other measures of value are injections of hemoplastin (P D & Co), or neohemoplastin (P D & Co), every 4 hours or coagulen (Ciba) twice daily In severe cases transfusion may be required

No food should be allowed except water and bits of ice until hemorrhage has ceased Feeding should then be resumed by allowing administration of dessert spoonfuls of glucose lemonade and dilute milk, etc, amount should be cautiously increased from day to day

Perforation—As soon as a diagnosis is made, surgery should be considered.

Phlebitis—The limb should be elevated and immobilized with pillows for 4 weeks Hot packs to the limb are of value After 4 weeks light massage and passive movements should be instituted

Prophylaxis—In adults two doses of T A B vaccine, ½ c c and 1 c c are injected at 7 to 10 days intervals Oral vaccine (billivaccine) has also been employed Three successive daily doses are given with a 3 grain keratin coated ox bile tablet on empty stomach

ENCEPHALITIS LETHARGICA

The causal agent is thought to be a filterable virus Dissemination is by droplet infection Infectivity is low and case to case infection is rare. Mild and abortive cases are not uncommon and along with carriers play a major role in spread Incubation period is uncertain.

Treatment—Treatment is on general lines and symptomatic Skilled nursing is important Patient is kept in bed and fed on the lines of enteric fever. Feeding by nasal tube may be necessary. At least 4 to 6 pints of glucose lemonade should be given daily Constipation is a feature of the condition and

needs treatment by laxatives and enemata Retention of urine may occur and requires prompt attention Headache needs aspirin for relief and lumbar puncture if the C S F is under pressure Insomnia, restlessness and delirium are treated by routine measures such as ice cap, sponging, fluids, glucose and if necessary chloral, bromides or phenobarbitone Nasopharynx, mouth and throat should be kept clean by Condy's fluid 1 in 5,000 or dettol or other suitable disinfectant

Drugs—Hexamine may be given by mouth in doses of 10 grains t.i.d. Intravenous injections of iodine (10 per cent sodium iodide in water) should be given in doses of 50 c c three times a week, if there is no idiosyncrasy Otherwise lipiodol 2 c c should be given intramuscularly three times a week When symptoms of Parkinsonism (tremors, rigidity, salivation and oculogyric spasms) develop, treatment is by use of drugs of belladonna group, amphetamine, phenobarbitone, massage and movement A number of new drugs are at present under investigation and the results are encouraging Among these, ones that deserve a mention are parpanit, myanasin and artane

Tremor—Hyoscine hydrobromide 1/150 grain three times daily or tincture strammonium in gradually increasing doses from ½ to 2 drams three times a day is recommended Amphetamine (M. & J.) 10 to 20 mg twice daily is also of value

Rigidity—Strammonium as above is combined with massage and passive movements

Oculogyric Spasms—Phenobarbitone 1 grain should be given morning and evening

ERYSIPELAS

The patient should be confined to bed and isolated until the temperature is normal and the lesions healed The diet should be liquid or semisolid while the temperature is high Fluids, glucose, lemonade and fruit juices should be freely drunk The bowels should be kept open by laxatives and enemata Headache may need analgesics, noisy delirium, hyoscine hydrobromide gr 1/200 to gr 1/100 Cardiac and respiratory stimulants like coramine and cardiazol may be required

Local Treatment—The affected part may be covered with lint wrung out of an iced saturated solution of magnesium sulphate Applications of ultra-violet rays have also proved useful.

Specific Treatment—Sulfonamides have reduced the mortality considerably Two tablets may be given crushed and suspended in milk, orange juice or water every 4 hours day and night As the condition improves, the dose may be reduced Penicillin is also valuable and may be used as crystalline penicillin G 3 hourly or as procaine penicillin G 12 hourly

GLANDULAR FEVER

The etiology is unknown and the infectivity low. The disease is probably spread by droplet infection The incubation period is 5-15 days In children

there is fever accompanied by acute enlargement of lymph glands, particularly of the neck, in young adults febrile and anginose types are common. Mononuclear leucocytosis is characteristic

Treatment—This is purely symptomatic and on general lines The patient is kept in bed on liquid and semisolid diet and plenty of fluids. Hot fomentations should be applied to the neck if the glands are swollen and painful *The throat should be kept clean and sprayed with* soluseptasine topical The fever runs a course similar to paratyphoid.

Sulfonamides—These should be given in adequate dosage.

INFLUENZA

It is primarily a virus infection transmitted by droplets but may also be spread by articles recently contaminated with nasal and buccal secretions The incubation period is approximately 48 hours The onset is abrupt and marked constitutional disturbance is characteristic In febrile catarrh, coryza, sorethroat and cough precede fever by several days

Treatment—The patient must be isolated and kept in bed in a well ventilated room The mouth, the nose, the eyes and the skin need careful cleaning. Tepid sponging is very comforting when the temperature is above 103°F. Bowels should be kept open by suitable laxatives The diet should consist of hot fluids at 2 hourly intervals, water and glucose orangeade Headache, insomnia and general discomfort are allayed by a powder containing 5 grains each of aspirin and Dover's powder For cough, dram doses of syrup of codeine or cosylan (P D & Co), every 4 to 6 hours are useful Steam impregnated with tincture of benzoin or oleum eucalyptus should be inhaled If chest symptoms are prominent the following mixture may be given 4 hourly

℞	Tinct Ipecac	m	5
	Tinct Opii Camph	m	30
	Syr Pruni Virg	dr	2
	Aq Chloroform ad	fl. oz	1

Cyanosis calls for administration of continuous oxygen either by tent or nasal catheter.

Cardiac embarrassment requires intravenous glucose, cardiazol and coramine.

Sulfonamides have no effect on the virus of influenza but when secondary invaders are present they have undoubted value

Convalescence—During convalescence rest, holiday and a tonic are of value

MEASLES

The disease is particularly serious in children under three years, owing to the risk of a complicating broncho-pneumonia Infectivity is very high. The causal agent is a filterable virus, spread by *droplet infection* particularly during the catarrhal stage. Incubation period is 9 to 11 days but may vary from 7 to 14 days

General Management—The child must be isolated and confined to bed in a well ventilated room The bed should be so placed that the patient does not face light. The mouth and nose should be cleansed at regular intervals. Eyes should be irrigated with warm boric lotion. The skin should be sponged with soap and warm water daily

Diet—In the absence of diarrhea, milk, fruit juices, glucose and water should be given As the patient becomes afebrile, semisolid and later solid food should be permitted.

Hyperpyrexia—Ice to the head and tepid sponging every 6 hours

Cough—A sedative linctus like syrup codeine or syrup cocillana co. may be combined with steam inhalations impregnated with Friar's balsam

Diarrhea—The milk should be stopped and the child given only 1 to 2 ounces of 2½ per cent glucose every 2 hours for 24 hours. Whey, albumin water, lactic acid milk (2 drops lactic acid to one ounce skimmed cow's milk) are then cautiously allowed in feeds of 2 ounces every 3 hours Normal and half strength saline is liberally given between feeds.

Broncho-pneumonia—The treatment is like that of broncho-pneumonia in general Sulfadiazine or sulfamerazine should be given in adequate doses. Penicillin is valuable and the dosage has been discussed earlier.

If diphtheretic infection of throat occurs, 16,000 units of anti-diphtheretic serum should be injected at once.

Convalescence—A holiday, a course of ultra-violet rays and an iron and cod liver oil tonic are indicated

Prophylaxis—Passive immunization is accomplished by one of the following means

1 Intramuscular injection of 5 c c. of human convalescent serum or 10 c c of whole blood.

2 Intramuscular injection of 20 c c. of serum or 30 c c. of whole blood of an individual who has previously suffered from measles

3 Intramuscular injection of 8 c c of human immune globulin or gamma globulin

Except in ailing and weak children or children under 3 years the aim should be to produce attenuation This confers lasting immunity and is achieved by injecting half the dose

MUMPS

Mumps is caused by a filterable virus. Infectivity is high and lasts from onset till subsidence of swelling of salivary glands The incubation period is from 12 to 26 days, usually from 17 to 21 days The parotid gland is most frequently involved but submaxillary or sublingual glands may be exclusively affected.

Treatment—The patient is confined to bed, mouth kept clean by frequent gargles with 1 in 5,000 Condy's lotion or diluted listerine Hot fomentations should be applied to the swollen glands Diet should be fluid and semi-solid so long as there is difficulty in opening the mouth.

Orchitis occurs in about 20 per cent males above puberty Scrotum should be supported by hot dry cotton wool and suspensory bandage or a pillow Hoyle et at (1949) have reported on the prophylactic and curative value of diethylstilbestrol in mumps orchitis. The prophylactic dose is 1 mg daily and the curative 5 mg daily The reported results are excellent Recently aureomycin has been used in the treatment of mumps orchitis, pancreatitis and encephalitis with very encouraging results Meningeal symptoms occur in some epidemics and if severe are helped by lumbar puncture

Acute Poliomyelitis

It is a virus disease Spread is from person to person by droplet infection Carriers and unrecognised abortive cases play an important part in the spread The duration of infectivity is not known The incubation period is 2 to 14 days, average 7 to 10 days.

Treatment—In pre-paralytic stage the diagnosis is extremely diffi During epidemics C S F of cases suffering from fever, stiffness, hyperesth and pain in the back and limbs should be examined Isolation must be forced The patient should be kept in bed in a closed room The nose a throat should be kept clean The skin must be daily sponged The diet shou be fluid Painful muscles and limbs should be wrapped in hot cotton wo and a cradle used to support the weight of the bed clothes Aspirin 2 to 10 grain according to age should be given 4 hourly Chloral and bromide should b prescribed for restlessness and insomnia

Serum from a convalescent patient or one who has suffered from the disease should be used if a diagnosis in the pre-paralytic stage is made Lumbar puncture is performed, 10 to 15 c c of C S F withdrawn and a slightly smaller quantity of serum injected. Sulfadiazine may be given in addition

Paralytic Stage—The Kenny concept is a definite advance on the previous treatment of poliomyelitis According to sister Kenny the cardinal symptoms of poliomyelitis are: (1) muscular spasm, (2) in-co-ordination, and (3) mental alienation Muscle spasm gives rise to pain, tonic contraction of muscle fibre, hyper-irritability to stretching and a condition in which the involved muscle tends to shorten itself, accompanied by inability to relax or lengthen The condition is widespread throughout the body In an acutely ill patient the muscles are painful, tender and in spasm Weakness and apparent paralysis usually are due to these symptoms and not to flaccid paralysis End results of untreated spasm are the shortening and fibrosis in involved muscles, contractions and deformities, and limitation of joint movement. Mental alienation means the patient's inability to move a muscle actively and purposefully, although no anatomic break exists in the regular nerve supply of the muscle In-co-ordination is that condition in which there is an attempt to substitute the muscle action of surrounding muscles for that of involved muscles by a change

in the normal neuro-muscular mechanism. The Kenny treatment aims at combating spasm, alienation and in-co-ordination as soon as possible. The most urgent therapeutic measures are directed against spasm and consist of special hot packs to the affected muscles, rest in the physiological position in bed and avoidance of all irritation which might aggravate the spasticity When the spasm has been released, meticulus muscle training can be started, 'muscle awareness' developed, co-ordination in use of muscles taught and alienation further prevented. Splinting is never used. Deformity is prevented by overcoming the deforming force of the spasm In this concept deformities do not occur as a result of unopposed pull of muscles but follow contraction and contractures in involved spastic muscles Respirators are not used; if spasm in the intercostal and other muscles of respiration can be treated properly, recovery is much faster and end results improved Patients are more comfortable and alert under Kenny treatment than previously, those with residual paralysis are in better shape for orthopedic operation later when indicated. Percentage of recovery is much higher than in earlier series

The British Committee of Neurologists and Orthopedists who evaluated her treatment state that the treatment is of value but her claims are very exaggerated Their conclusions are reproduced earlier in the section on physical therapy

Prostigmine—Kabatt and Knapp studied the effects of prostigmine on 24 patients suffering from poliomyelitis between the ages of 2 to 46 The onset of paralysis varied from 3 weeks to 17 months It was found that atropine sulphate given simultaneously with prostigmine eliminated certain unpleasant parasympathetic effects without producing any apparent inhibition of the important effects on muscle function The most significant effect of the drug was relaxation of muscle spasm and pain The drug increased range of passive motion, decreased or eliminated deformities, and in some instances showed more rapid improvement when prostigmine was added to the Kenny routine.

Pyridoxine Hydrochloride—This substance in doses of 50 mg has been recently advocated It is claimed that there is relaxation of muscular rigidity, improvement in muscle strength and increase in range of passive and active movements within 24 hours after intraspinal administration of 50 mg of pyridoxine

Curare—Intocostrin (Squibbs) has been favourably reported upon by many observers

Prophylaxis—The contacts should gargle with a 1 in 5,000 solution of pot permang morning and evening Five c c of convalescent serum obtained from a patient within 10 days of his becoming afebrile should be injected intramuscularly and would afford protection for about 3 weeks Attempts at active immunisation have not proved successful

Scarlet Fever

An infection of throat with certain strains of S hemolyticus which produce a soluble toxin. Mild cases and carriers play important part in spread.

Infection is from case to case by droplets or by infected articles The incubation period is from 2 to 4 days but may vary from 1 to 7 days In this country the disease is rare.

Treatment—This consists of general management as for febrile conditions, early use of serum and in septic cases sulfonamides or penicillin

General Management—The patient should be isolated and kept in bed. The nose and throat should be sprayed with normal saline or warm bicarbonate of soda lotion every 2 to 4 hours. The nostrils and upper lip smeared with vaseline or boric ointment Hot fomentations should be applied to swollen and painful cervical glands The skin should be sponged frequently If itching is present borocalamine lotion should be freely applied or skin sponged with a tepid solution of a teaspoon of sodium bicarbonate in 2 pints of water The urine should be tested daily for any signs of nephritis The ear drum should be inspected frequently For headache and general discomfort an analgesic like aspirin should be prescribed For insomnia and restlessness, chloral hydrate and bromides are useful The diet, at first liquid, should be increased after subsidence of fever

Serum—Serum should be given early in toxic and septic cases with an evening temperature of 103°F or over In mild cases no serum need be given. The total dose 10 to 30 c.c in mild cases and 60 to 120 c c in severe cases is given at one time The usual route is intramuscular but in severe cases the intravenous route is preferable

Sulfonamides—They have no use in simple scarlet fever, in septic cases sulfadiazine should be given 4 hourly in adequate dosage

Penicillin—In septic cases a daily injection of procaine, penicillin-G in doses of 300,000 units is recommended

Prophylaxis—Susceptibility to scarlatina is determined by intradermal injection of 0.2 c c of diluted scarlet fever toxin, in susceptible persons within 12 hours an area of erythema 1 cm or more in diameter results Dick Test material is available commercially Those who are Dick positive may be given by subcutaneous injection at weekly intervals 500, 2,000, 8,000, 25,000 and 50,000 skin test doses of sterile scarlatinal toxin, to give active immunity which lasts about 4 years.

Dicks have now introduced effective oral toxin in tablet form Enteric coated tablets are given after food for 6 days

For passive immunity or contacts 5 to 10 c c of a potent scarlet fever anti-toxic serum confers immunity for 10 to 14 days

SMALL POX

Infection is case to case but the virus may be conveyed by infected clothing, letters or other articles Virus probably enters by respiratory tract.

Incubation period is usually 12 days, may vary from 8 to 16 days Infectivity persists until all crusts have separated from the skin

Treatment—This consists of general and local measures and the use of sulfonamides or penicillin in standard doses to reduce the secondary infection of the pustules.

General Measures—These consist of isolation, bed rest, tepid sponging with weak potassium permanganate (1 : 5,000), liquid diet and care of the bowels. Eyes, nose, mouth, throat and larynx need careful watch and treatment. Eyes should be irrigated with warm boric lotion 4 hourly and 10 per cent argyrol dropped morning and evening and the edges smeared with boric ointment. Mouth and throat should be cleaned with 1 in 5,000 potassium permanganate or hydrogen peroxide diluted with 2 volumes of water

Local Measures—An aqueous solution of potassium permanganate 1 to 5 per cent according to sensitivity of skin, should be daily painted on the skin. During papular and vesicular stages talcum powder or boro-calamine lotion allay skin irritation Daily permanganate baths should be advised During the pustular stage the patient unless too ill should be immersed thrice daily for half an hour each time in the permanganate bath The offensive smell should be masked by sprinkling eucalyptus oil on and around the bed. Application of starch boric poultices hastens separation of scabs

Sulfonamides—Sulfadiazine or other suitable sulfonamide helps in tiding over the severe pustular stage with much less damage than would have been the case if the drug was not given The dose is 1 Gm 6 hourly day and night. Complications are few in sulfonamide treated cases

Penicillin—It has a favourable effect due to control of secondary invaders in the pustular stage

Prophylaxis—Primary vaccination should not be performed until the fourth month, and should be postponed in debilitated, febrile, eczematous children or those recently exposed to infectious diseases Skin is cleansed with soap and warm water, wiped with industrial spirit and allowed to dry. A drop of lymph is expelled on the skin and single linear scratch ¼ inch long made through lymph with sterile needle The scratch should not draw blood. Cross-scarification should be avoided The child should be revaccinated when the child is 5 years old and again between 14 to 16 years In exposed persons immediate vaccination should be performed unless there is reliable evidence of successful primary vaccination within the last 3 years, or revaccination within the last 5 years

TETANUS

General Management—The patient should be isolated in a quiet darkened room Control of convulsions is of paramount importance and for this purpose all stimuli should be eliminated and physical examinations cut to a minimum.

Specific Therapy—The patient is tested for sensitivity to horse serum. If found sensitive, he is desensitized in the usual manner and 50,000 units of

tetanus anti-toxin administered intramuscularly If the patient is not sensitive an injection of adrenalin 5 minims is followed in thirty minutes by an intravenous injection of 50,000 units of the anti-toxin An additional 10,000 units are injected in the area surrounding the wound. On subsequent days 10,000 units are injected daily.

Control of Convulsions—This is achieved by the use of sedatives Suitable sedatives to employ are tribromo-ethanol rectally, paraldehyde intramuscularly, intravenously or rectally or sodium amytal intramuscularly The aim of sedation should be to relax the patient but not to produce profound unconsciousness The initial dose of avertin with anylene hydrate is 25 mg. per kg body weight given rectally and followed by 10 to 15 mg per kg at 15 to 30 minute intervals as indicated by the response of the patient The sedative effect may last 1 to 4 hours and when the symptoms recur, treatment should be repeated

When sodium amytal is selected to be used the initial dose is 5 mg per kg body weight in a 10 per cent aqueous solution intramuscularly Do not exceed 240 mg for children and 480 mg for adults To minimize the respiratory depression, the smallest effective dose of the drug should be used

The dose of paraldehyde is 4 to 6 c c by mouth, 2 to 4 c c intramuscularly or intravenously for rapid sedation and 10 to 40 c c by rectum every three hours

In cases of average severity chloral hydrate 2 to 3 grams in olive oil or water may be given rectally every four hours

The use of curare and myanesin are promising but still in the experimental stage

Local Treatment—Following thorough debridement, the wound is irrigated with hydrogen peroxide and dressed with gauze Dressing should be changed every four hours

Symptomatic Measures—Specially trained day and night nurses are an asset If the patient is unable to take food by mouth intravenous glucose should be given as required Bladder distension should be watched for and relieved by catheterization Bowels should be kept open The posture should be changed frequently to prevent pneumonia

Prophylaxis—In wounds likely to be infected with garden manure, in bites or wounds from horses, in gunshot wounds, in addition to thorough cleansing, an intramuscular injection of 1,500 to 3,000 units of anti-toxin should be given

Active immunization is achieved by 2 doses of 1 c c of formol toxoid with an interval of 6 weeks between injections

Typhus

For purposes of therapy, all the rickettsial diseases are considered under this head They include typhus fever caused by rickettsia prowazeki transmitted by lice (epidemic type) or rickettsia mooseri transmitted by rat-flea (murine type), rocky mountain spotted fever caused by rickettsia rickettsii and transmitted by tick bite, scrub typhus (tsutsugamushi) caused by rickettsia orientalis and transmitted by larval mites, Q fever caused by coriella

Convalescence—During convalescence, ultra-violet rays, a holiday in mountains or on the sea-side, a high vitamin diet and [illegible] are indicated.

Prophylaxis—Infants and children up to 5 years should be immunised [illegible] H. pertussis vaccine made from killed phase I strain. The first injection [illegible] 4,000 millions is given at the age of 1 year. The injection is repeated [illegible] week, again after a month and again after a month.

For passive immunity of contacts 10 cc. of convalescent serum [illegible] immunity for 3 weeks.

Septicemia

Precise diagnosis should be made of the type, strain and if possible the quantity of the infecting organisms. Blood culture should be done prior to treatment with sulfonamides or a suitable antibiotic.

Treatment—Skilful nursing, nourishing diet, blood transfusions and use of sulfonamides or antibiotics are the chief weapons.

Sulfonamides—In infections with hemolytic streptococcus and pneumococcus the appropriate sulfonamide is sulfamerazine. Its dose is 1 G. every [illegible] hrs. The initial dose should be 2 G. In infections with meningococcus [illegible] is the preparation of choice.

Penicillin—In septicemias due to streptococcus viridans (subacute bacterial endocarditis) and staphylococcus aureus the sulfonamides have proved useless. Penicillin on the other hand is of definite value. The dosage of penicillin for staphylococcal infections and subacute bacterial endocarditis has to be much higher than in case of streptococcal, pneumococcal and gonococcal infections. Doses of 25,000 units intramuscularly are recommended every 3 hours day and night. Higher doses may be necessary if the response is not satisfactory. Treatment needs to be continued for periods varying from 2 to 4 weeks.

Other Antibiotics—Septicemias due to E. coli, streptococcus fecalis and other organisms refractory to penicillin or [illegible] should be treated by use of streptomycin, aureomycin or other suitable a[illegible]

Blood Transfusion[illegible] ...d to three [illegible] of whole blood will usually suffice. P[illegible]) is valuable [illegible] is available and in absence of anemi[illegible]

General Managem[illegible] of bed [illegible] plenty of fluids and an [illegible] ...ting of plenty of [illegible] ds and fruit [illegible]

Bowels require the use of enema or a glycerine suppository rather than a laxative Paraffin by mouth may be given

Pain, sleeplessness, toxemia and circulatory failure are treated on usual lines

Tuberculosis

An early diagnosis of tuberculosis is of prime importance for a successful treatment of the condition Immediately after a diagnosis has been made, the physician in consultation with the patient and his relations should formulate a plan of the therapeutic measures taking the particular circumstances of the case into consideration Is the patient to be treated in the home? This will depend upon the facilities available in the home On the other hand a young person with exudative phthisis should be advised that the first stage of treatment is best carried out in a sanatorium The experience gained by the patient through routine of sanatorium life is most useful to him in educating him for regulating his life in future Unfortunately sanatorium beds and particularly free beds are extremely few in this country

Rest—Of the traditional triad, rest, fresh air and good food, the most important is rest Rest is often insufficiently prescribed and enforced, firstly, because of the teaching which used to stress unduly the value of graduated exercise in open air at an early stage, secondly, because severe symptoms due to tuberculous toxemia often disappear long before local lesion is sufficiently healed to make it permissible for exercise to be started and the patient feels too well to lie in bed; thirdly, because individual and public economic difficulties militate against prolonged rest and lastly because of the inadequate appreciation of the criteria on which control of rest is based These criteria are temperature, pulse rate, weight, general symptoms, X-ray and blood sedimentation rate and the sputum examination A careful record of temperature is necessary Routine temperatures should be charted four hourly The thermometer should be kept below the tongue for 3 minutes with the mouth closed and no hot or cold food or liquid taken immediately beforehand Rest in bed throughout 24 hours should be the rule in patients with exudative phthisis until temperature has completely settled When pyrexia is only moderate and no other contraindications exist patient may be allowed up for toilet purposes and this conduces to mental and physical comfort. A resting pulse of 90 or more is indication for continuation of bed rest. Patients should be kept in bed till their blood sedimentation rate (Westergren) has fallen below 12 Normal is below 6, in progressive tuberculosis it is from 14 to 100 A sedimentation rate of 12 or under is important evidence of quiescence No patient should be allowed out of bed till the nutrition has become reasonably satisfactory and the patient has started putting on weight. Exacerbation of the patient's symptoms or appearance of fresh ones also calls for a limitation of patient's activities

Pulmonary Tuberculosis—Streptomycin is an important adjuvant to other accepted modes of therapy in pulmonary tuberculosis It is indicated in:

1. Recent and exudative variety of the disease;

2. Minimal lesions if there is evidence of activity, especially now that the objections based on streptomycin resistance are no longer valid;

3 Recent but progressing and extensive pulmonary lesions, especially if these are diffuse and finely disseminated rather than appearing as large, dense, localized shadows in roentgenograms;

4. Tuberculous pneumonias;

5 Progressing ulcerative lesions of the tracheobronchial tree;

6 Preparatory to or in combination with surgery in the treatment of cavities

Under streptomycin therapy clinical improvement is rapid and many cases show sputum conversion and radiological improvement

Streptomycin therapy must be accompanied by administration of PAS, as the two together delay and suppress the emergence of resistant strains. Hughes (1950) recommends 1 or 2 G of streptomycin every third day combined with 12 G of PAS, daily for 120 days or longer if necessary, and this dose schedule has been found to be the best so far in practice.

Laryngeal Tuberculosis—Symptomatic relief quickly follows tration of streptomycin in laryngeal tuberculosis. The pain disappear in more than two-thirds of the cases within a Hoarseness disappears more slowly. Healing takes relief. There is no advantage in giving streptomycin by or in combination with intramuscular treatment.

Tracheobronchial Tuberculosis—The response to the is good and recovery may be expected in from 50-90 when bronchial stenosis is present. In this as in intramuscular therapy is indicated. Aerosol combination with intramuscular injections has

Intestinal Tuberculosis—Like other of pulmonary tuberculosis, intestinal tuberculosis streptomycin. Treatment is best given ineffective.

Oro-pharyngeal Tuberculosis—Tuberculous ulcers of the mouth, tongue and pharynx respond dramatically to treatment by streptomycin Pain is relieved within a few days and the ulcers heal within a few weeks

Tuberculous Peritonitis—Reported results from the treatment of this condition by streptomycin are excellent The fever subsides, the ascites disappears, there is amelioration of abdominal symptoms and striking gain in weight in approximately 80 per cent of the patients Post-treatment biopsies reveal no evidence of persisting peritoneal tuberculosis

Sinuses and Fistulae—Draining cutaneous sinuses and to a lesser extent fistulæ provide one of the most fruitful fields for the successful use of streptomycin If pus is present, it should be evacuated, if necrotic tissue or bone is present it should be removed. Streptomycin is given parenterally Local streptomycin may be employed in addition.

Bone and Joint Tuberculosis—It is not possible at the present time to assess correctly the value of streptomycin in orthopedic tuberculosis Some improvement occurs in large majority of cases Soft tissues show improvement earlier than bone and the limb lesions earlier than those in the spine The Roentgenologic changes are more difficult to evaluate During the first four months of therapy they are stabilized, during the second four months they show a slight improvement How much of this improvement results from streptomycin therapy is difficult to say

Tuberculous Lymphadenitis—A correct appraisal of the value of streptomycin in tuberculous lymphadenitis is at present not possible A considerable number of both acute and subacute cases improve under treatment Some cases fail to respond When suppuration is present, streptomycin therapy should be combined with surgery.

Genito-urinary Tuberculosis—Like other mucous membrane lesions bladder lesions respond dramatically Some cases of renal disease also show a good response On the other hand when lesions of the kidneys are marked and there is evidence of destructive changes in the pyelograms, they are relatively unaffected by streptomycin Genital tuberculosis especially prostatitis is unaffected, though when there are scrotal sinuses, these usually heal

Tuberculous Empyema—Streptomycin either alone or in combination with pleural drainage is not effective in the treatment of this condition Streptomycin may, however, permit definitive surgical treatment by decortication

The failure of streptomycin therapy in empyema is probably due to the acid reaction of the pus

Tuberculous Otitis Media—Streptomycin has a definite value in the treatment of this condition and a large percentage of cases respond.

Lupus Vulgaris—Combined treatment with streptomycin and calciferol is of value.

Paraaminosalicylic Acid—Lehman studied the action of a large series of compounds structurally related to salicylic acid and was able to show that paraaminosalicylic acid (PAS) was an active inhibitor of the tubercle bacillus in-vitro. Extensive clinical investigations have indicated its usefulness in human tuberculosis either when used by itself or in conjunction with streptomycin Besides pulmonary tuberculosis it has been used with benefit in miliary tuberculosis, tracheobronchial tuberculosis, in urinary tract lesions, intestinal tuberculosis, lupus vulgaris, uveitis, cervical adenitis and ulceration of the skin The daily dose of PAS is about 12 Gm and that of its sodium salt 16 Gm The toxic effects are not serious and include anorexia, nausea and vomiting These can be reduced by administering the drug on empty stomach by using enteric coated and stearic acid coated granules of PAS or by giving sodium carbonate or dramamine at the same time

The drug is inferior to streptomycin as a tuberculostatic agent but the two drugs act better than streptomycin alone. Its greatest use lies in its power of suppressing and delaying the emergence of resistant strains of tubercle bacilli Development of resistance to PAS has been reported but is infrequent

Thiosemicarbazones—Domagk (1946) was the first to report on the tuberculostatic effect of TB_1 in experimental animals The drug received an extensive clinical trial in Germany in the succeeding years and Hinshaw and McDermott (1950) evaluated the reported results with the new drug They emphasized the toxic effects of the drug and recommended a properly controlled study in the States This study was carried out and with the dose recommended (50 mg daily during the first week, 100 mg daily during the second week and 200 mg daily thereafter) the drug did not show convincing evidence of therapeutic efficacy. Toxic side reactions developed in about a third of the cases treated and in about 40 per cent drug resistance developed within 120 days

Isonicotinic Acid Hydrazide (Rimifon, Nydrazid, Marsilid)—Hydrazine derivatives of nicotinic acid have been found to be of value in the experiment tuberculosis of animals Robitzek and Selikoff (1952) used rimifon and marsilid in 41 human cases of acute febrile caseous pneumonic tuberculosis Therapy ranged from 4-15 weeks. All patients experienced rapid and marked reversal of their original toxic states, as evidenced by gain in weight, return of appetite defervescence, and a sharp return in sense of well-being

Cough and expectoration have been eliminated or markedly reduced.

Sputum bacillary contents have been reduced in 38 cases, and in 8 cases examinations for acid-fast bacilli on stained smears have been repeatedly negative

On roentgenographic examination, reduction in cavity size has occurred in 17 cases and apparent diminution in exudate has occurred in 5 cases

Therapeutic effects of isonicotinic acid hydrazide (rimifon) after four weeks at 4 mg per kg daily are roughly equivalent to 1-isonicotinyl-2-isopropyl hydrazine (marsilid) at the same dosage and for the same period

The incidence of early side reactions is moderately higher with the isopropyl derivative (marsilid) therapy at comparable dosages although, from tentative and preliminary animal studies, isonicotinic acid hydrazide (rimifon) might have a higher potential delayed toxicity.

The hydrazine derivatives of isonicotinic acid exert an impressive therapeutic effect upon the course of acute caseous pneumonic tuberculosis in humans

Surgical Treatment—The surgical treatment of pulmonary tuberculosis includes measures like phrenic evulsion, artificial pneumothorax, thoracoplasty, direct drainage of cavities, lobectomy and pneumonectomy. Artificial pneumothorax for many years, the most popular measure in the treatment of pulmonary tuberculosis, is now being advocated less and less Thoracoplasty in suitable cases combined with chemotherapy is a valuable procedure.

The surgical treatment of extrapulmonary tuberculosis includes excision and immobilization in plaster.

Symptomatic Treatment :

Cough When there is expectoration some cough is necessary A warm alkaline drink is often helpful in loosening the secretion

R

Sod Bicarb	..	gr	15
Sod Chlorid	.	gr	5
Spt Chlorof	.	m	5
Aq Anisi ad	.	oz	1

To be taken in a cup of hot water, first thing in the morning Patients with cavities often find certain postures useful in draining out the cavities

Dry cough, or cough with scanty expectoration is helped by sedatives. Syrup codeine in doses of 1 to 2 drams or a cough linctus like the following are useful

R

Heroin Hydrochlor	...	gr.	1/10
Glycerin	...	gr.	15
Syrup Tolu	...	dr	1

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Heroin Hydrochlor	gr	1/10
Glycerin		
Syrup Tolu	gr.	15
	dr	1

[illegible] P. D. & Co.), syrup glycodin terp vasaka (alembic) and similar proprietary preparations may also be employed.

Hemoptysis—Rest in bed in a suitably propped up position, a sedative to allay restlessness and anxiety and, cold and fluid diet are important. An intravenous injection of 10 i u of pituitrin in 10 c c. of normal saline given slowly over a period of 10 minutes, with the patient supine, is always followed by a prompt response Other measures which have been recommended from time to time include injections of morphine, calcium, emetine, hemoplastin, coagulen (CIBA), and congo red or the use of amyl nitrite by inhalation Collapse of the lung has been recommended if the side of the hemorrhage is known.

Gastro-intestinal Symptoms—A poor appetite and dyspeptic symptoms often disappear with rest and fresh air treatment Overfeeding should be avoided. Achlorhydria should be suitably corrected. Constipation or diarrhea need treatment on usual lines.

Prophylaxis—Dependable immunity to tuberculosis does not develop among persons who have been infected with tubercle bacilli or even those who have had mild or extremely severe clinical disease For this reason no one has ever been able to produce dependable immunity by artificial immunizing agents. Living tubercle bacilli with reduced virulence have been extensively used These result in a allergy of the tissues which temporarily retards the movement of tubercle bacilli if they later enter Allergy does not prevent subsequent infection [illegible] tubercle bacilli nor does it destroy them

[illegible] Guerin (BCG), as a means of immunizing against [illegible] under consideration for a number of years It is being [illegible] among non-reactors to tuberculin in many parts of the [illegible] that the body develops resistance to these [illegible] may be helpful if and when virulent organisms [illegible]

a year or less after their vaccination, and very occasionally no sensitivity is conferred A scientific and well controlled study of the efficacy of BCG has never been conducted sufficiently long to justify any final deduction Several workers have observed that among persons who have received BCG, a smaller number developed conditions such as erythema nodosum, enlargement of pulmonary hilar shadows, pleurisy, meningitis and other conditions which occur within a year or so after allergy is established than among the controls Other workers have seen no difference among those vaccinated and the controls

The use of BCG should be pending further study to supplement already existing methods of control Consideration has been given to administering BCG to all tuberculin-negative individuals where risk of infection is great. In this category may be grouped nurses and medical students who are found to be tuberculin-negative They may be vaccinated before assuming hospital duties

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Bacillus Calmette-Guerin (BCG), as a means of immunizing against tuberculosis has been under consideration for a number of years It is being extensively employed among non-reactors to tuberculin in many parts of the world It is used on the theory that the body develops resistance to these organisms of low virulence which may be helpful if and when virulent organisms invade the tissues

Workers in this field are not in agreement as to what constitutes a satisfactory BCG vaccine, that is, just what degree of virulence it should possess before administration, how it should be administered (some give it by mouth, some subcutaneously, and still others by puncture method), and how much resistance or immunity develops from its use (there is no test for immunity, tuberculin reaction only indicates the presence of allergy). The virulence of BCG varies greatly when it is grown on different kinds of culture media

Although BCG vaccine appears to be harmless it has been suggested by some workers that the attenuated bacilli might regain their virulence in the human body. Recently, it has been found to produce destructive, progressive, and killing tuberculosis in silicotic ani[illegible] as well as those on deficient diets It has also been realised that individ[illegible] [illegible]n-negative within

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CHAPTER VII

TROPICAL DISEASES

Tropical Neuresthenia

As in a large number of cases there is a background of physical disease or fatigue, a thorough investigation is necessary Malaria, dysentery, helminthic infection, gastric dysfunction or gall bladder disease, sinusitis, tonsil or teeth infection, an error of refraction or anemia, if discovered, should be adequately treated Insomnia should be treated by mild hypnotics like adalin or soneryl (2 tablets) Headache is treated by use of optalidon (Sandoz) or saridon. Alcohol should be forbidden and patient sent for a change of climate to a hilly place

Tropical Liver

A hyperemia within physiological limits at first, later becomes pathological congestion The main symptoms are headache, dirty tongue, loss of appetite, tiredness, a feeling of weight below the diaphragm, some tenderness in the liver region, an unhealthy coloration of the skin and sometimes an icteric tint of the conjunctiva The condition may be due to a parasitic infestation or an unsuitable, high fat, seasoned diet with excess of alcohol. Treatment should include eradication of parasitic infection (malaria, dysentery) correction of diet and use of calomel at bed time followed by a morning dose of saline for a few days Use of alcohol must be forbidden.

Malaria

Therapy—Before the second World War the only anti-malarial drugs known were quinine and other alkaloids of cinchona, atebrine and plasmoquin. During the course of the war several new compounds were introduced. British workers introduced paludrine which is now known as proguanil, the Germans introduced a new compound called nivaquine (S N 6911) and the Americans, chloroquine (SN 7618) and pentaquine an anti-malarial drug like plasmoquin or pamaquin Other compounds that deserve mention are isopentaquin and primaquin, and camaquin

Before describing the routine methods of treatment in malaria it will be of value to consider the effects of drugs on the different stages in the life cycle of plasmodia

Sporozoites—When an infected mosquito bites a man, the sporozoites introduced with the bite do not remain in the blood for more than 30 minutes Probably because the sporozoites represent a resting stage and their metabolism is low, they are not attacked by any known anti-malarial drugs

Primary Exo-erythrocytic Forms—The primary exo-erythrocytic forms are destroyed by a number of drugs which are termed true causal prophylactics

Pamaquin and pentaquin act as true causal prophylactics both against P. vivax and P. falciparum Proguanil (paludrine) has been shown to be a causal prophylactic against P. falciparum and a partial causal prophylactic against P vivax.

Asexual Blood Cycle—The asexual blood parasites can be removed from the circulation temporarily by cinchona alkaloids, mepacrine, chloroquine, proguanil and metachloridine. In the case of P falciparum infections there is evidence that mepacrine, chloroquine and proguanil if given over a considerable period, will entirely eliminate the infection In case of P vivax infections relapses will inevitably occur sooner or later This difference is due to the fact that in P. falciparum infections the exo-erythrocytic forms are destroyed rapidly so that if the blood forms are all killed, there is no reservoir from which the infection can be started afresh In P vivax infections combined use of quinine and plasmoquin or quinine and pentaquine will eradicate the exo-erythrocytic forms

Sexual Cycle—The gametocytes of P falciparum and to a less extent of ther malarial parasites are rapidly destroyed by pamaquin and pentaquine roguanil does not destroy the gametocytes while they are in the blood stream of man, but does interfere with the formation of oocyst in the anopheline mosquito

Treatment of Acute Primary Attack :

The drugs of choice are paludrine and chloroquine Paludrine is best given in doses of 0 3 Gm three times a day The treatment lasts for 3 days After this one or two tablets a week may be given to prevent relapses over long periods The tablet should be taken with a large tumbler of water

Chloroquine—Chloroquine is given either as chloroquine diphosphate or chloroquine base The dosage scheme for chloroquine base is 0 6 Gm followed by 0 3 Gm in 6 hours After this daily doses of 0 3 Gm for two more days are given When chloroquine diphosphate is employed the initial dose is 1 0 Gm and is followed by 0 5 Gm in 6 hours Two more daily doses of 0 5 Gm are administered for a course

Other drugs of value are quinine, atebrine or mepacrine, nivaquine and camaquine or cam-aqi

Quinine—The drug is now being used less and less in the treatment of acute primary attacks The reasons are its unpleasant taste, toxic side effects and unsuitability in the treatment of falciparum infections In Africa where falciparum infections were not treated by quinine black water fever was prevented The adult dose of quinine in malaria is 7 grains three times a day in capsules The drug should be taken after meals

Mepacrine—The scheme advised is 2 tablets of 1½ grain each three times a day for 2 days, thereafter one tablet t i d for 3 days The drug gives rise to a yellow coloration of the skin and conjunctivæ

Camaquine (cam-aqi)—The course of treatment consists of either two doses of 0 25 Gm each at an interval of 12 hours or a single dose of 0 5 Gm

Nivaquine C—The course lasts 5 days and the total amount of the drug required is 1.8 Gm

All the drugs are effective in controlling clinical symptoms of both vivax and falciparum malaria. Cam-aqi is probably the most effective out of the newer drugs—paludrine, nivaquine, chloroquine, oxychloroquine and cam-aqi It causes more rapid disappearance of fever and parasites in P. vivax infections than the others and is effective both against P. vivax and P. falciparum infections A single dose is sufficient to rid the blood of the parasites

Treatment of Cerebral Malaria—The drug of choice is atebrine musonate given I V in a dose of 0.125 Gm in 3 c c and repeated twice at 1 hourly intervals; 0 375 Gm can be given in one dose and is given intramuscularly

If atebrine musonate is not available, 10 grains quinine hydrochloride in 20 c c distilled water should be given slowly intravenously Other measures are inhalation of oxygen and amyl nitrite, lumbar puncture, intravenous plasma and glucose 5 per cent 20 ounces every 6 hours

Malaria in Pregnancy—Anti-malarials other than quinine should be employed

Treatment of Relapses—Courses of quinine and pamaquine or quinine and pentaquine should be given. The dose of pamaquin or pentaquin is 01 Gm. t i d for five days

Toxic Symptoms of Anti-malarial Drugs :-

Quinine—Fullness of the head and buzzing in the ears are common In susceptible individuals urticaria and other rashes, local swellings and hemorrhages and hemoglobinuria may occur. Infrequently miscarriage may be produced With large doses quinine amblyopia or blindness may occur. Intramuscular injections give rise to sloughing, necrosis and pain, headache, giddiness, anorexia, hemoglobinuria, epileptic fits and psychosis

Plasmochin or Pentaquin—It may give rise to epigastric pain, cyanosis, slight jaundice, and more rarely hemoglobinuria. Simultaneous administration of atebrine and plasmoquin is very toxic

Paludrine—Paludrine in large doses gives rise to vomiting and epigastric pain It should always be ordered to be swallowed with a large tumbler of water

Chloroquine—Chloroquine gives rise to occasional headache and vomiting Nivaquine C seems to have no side effects Camaquine or cam-aqi causes headache, giddiness, palpitation, nausea and vomiting, diarrhea and abdominal pain in some cases

General and Symptomatic Treatment—Every case must be carefully nursed in bed. The bowels should be opened initially by calomel at bed time followed by the morning saline and later by saline only. Diet at first liquid, with plenty of glucose, fruit juices and water should be gradually increased to full diet as the

fever is controlled The hyperpyrexia is controlled by use of ice cap, tepid or cold sponging or cold baths. If there is headache an analgesic is indicated Sleeplessness requires the use of bromides, chloral, phenobarbitone, soneryl, dial or other suitable hypnotic Vomiting must be treated on usual lines

Prophylaxis—Pamaquin and pentaquine prevent P vivax and P falciparum infection but owing to their toxicity cannot be generally used, four daily doses of 60 mg of the base are required before infection with sporozoites, on the actual day of infection and on the 6 succeeding days Primaquin also prevents infection and is much less toxic.

Proguanil or paludrine is also a true causal prophylactic against P falciparum infections and partial causal prophylactic against P vivax One tablet of 0 3 Gm on two days in a week will prevent attacks of malaria

Clinical prophylaxis can be achieved by use of 6 grains of quinine daily at bed time or 3 grains of atebrine (quinacrine) given twice a week Screening of houses, use of mosquito nets, destroying the larvæ and adult mosquitos and use of mosquito repellants (Sketofax—B W. Co) are useful measures

Black Water Fever

Patient should be put to bed and treated on the spot Transportation is very badly tolerated He should be kept warm and if possible a day and a night nurse provided Quinine must not be given. In majority of cases there are no parasites in the peripheral blood and no anti-malarial drugs are required If parasites are present atebrine in usual doses should be prescribed Acidosis should be counteracted vigorously. Fluids should be given *ad lib* Sodium bicarbonate, 30 grains to a pint, should be added to water, barley water or fruit juice Additional alkali can be given in mixture or as alkaline saline intravenously The reaction of the urine must be kept alkaline at all times to prevent hematin precipitation

Vitex Peduncularis—The liquid extract of the drug has been shown to have definite anti-hemolytic properties Cassia beareana and recently cassia fistula have been given in the form of extract with apparent success

Percorten with Vitamin C and Cholestrol—Recently percorten (CIBA) 25 mg immediately and 5 mg 4 hourly, combined with vitamin C in large doses intravenously or intramuscularly, and cholestrol 15 grains, 4 hourly by mouth has been given with uniformly satisfactory results

Blood transfusion of compatible blood is worth considering if anuria is not present.

Symptomatic Treatment :

Anuria—Glucose 5 per cent and sodium bicarbonate Gr 150 to a pint intravenously, hot fomentations and dry cupping to the loins, warm colon wash and warm citrate saline bladder wash (2 per cent sodium citrate in normal saline) are indicated.

Vomiting—Ten minims of adrenalin chloride in an ounce of water given by mouth or fractional doses of calomel, etc , are useful.

Cardiac Stimulation—Cardiazol, coramine or camphor in oil are indicated.

Prophylaxis—This is the same as for malaria, *viz*, atebrine or paludrine and thorough treatment of malarial attacks Vitex peduncularis extract may also be given whenever a patient in a black water fever country feels that a malarial attack is coming.

Convalescence—The patient should be kept strictly in bed for 10 days after hemoglobinuria has completely stopped, as sudden heart failure is common. Iron and liver should be given to correct anemia.

Kala-Azar

Drugs—Tartar emetic is no longer used. The pentavalent compounds of antimony, neostibosan, neostam, urea-stibamine (Brahmachari), amino-stiburea (Union Drug Co), and solu-stibosan are equally effective The trivalent compounds like antimosan and fouadin are less effective. Diamidino-stilbene is efficient even in resistant cases but is very toxic.

Neostibosan—It is given as a 5 per cent solution intravenously or intra-muscularly On the first day 0 1 G, on the second day 0 2 G, on the third and subsequent days 0 3 G. The total number of injections is 8 to 10.

Neostam—Neostam (B W. & Co), is given in similar dosage to neostibosan

Urea-stibamine—The first dose is 0 05 G, the second dose 0 1 G, third dose 0 15 G, fourth and subsequent doses 0 1 G. Injections are given intra-venously on alternate days or twice weekly for 12 injections

Diamidino-stilbene (M B. 744)—Eight to ten intravenous injections commencing with 45 mg in 10 c c of distilled water are given very slowly. Injections are given daily and increased each time by 0 01 G up to a maximum of 0 05 G The total dose is 0 75 G to 1 G. Unfortunately the drug gives rise to reactions such as headache, flushing of the face, sweating and burning sensation all over the body In severe cases there are giddiness, faintness, palpitation and vomiting In most severe cases collapse, loss of consciousness and loss of control of bowels and urine occur. Reactions are mitigated by injection of ¼ to ½ c c of adrenalin given before an injection

In half the cases treated with diamidino-stilbene there is trigeminal neuropathy The drug should be used with caution and only in antimony resistant cases.

Full therapeutic effect is not obtained for 10 to 14 days The liver and the spleen then shrink in size, the pyrexia drops, the weight increases and there is increase of leucocytes.

Other Measures—These include rest, good nursing, suitable diet, management of the bowels and coincident treatment of malaria and intestinal parasites Anemia needs to be treated by iron and liver and agranulocytosis by blood transfusion and injection of adrenalin.

Post Kala-Azar Dermal Leishmaniasis—Pentavalent antimony compounds as in kala-azar need to be exhibited, in obstinate cases trivalent compounds like antimosan and fouadin need to be given Diamidino-stilbene is of no value Potassium iodide in large doses (pushed to the point of iodism) is often helpful

Prophylaxis—Large scale treatment of cases, isolation of cases, burning of fomites, furniture and huts, construction of new huts and measures against sand-fly such as removal of inmates to an upper storey, burning of rubbish, smoking with sulphur fumes of latrines and houses, filling of cracks in wells with tar or mud, demolition of ruins, use of 45/46 mesh nets, D D T and repellent ointments constitute the chief measures Suitable ointments are

	Ol Anis	
	Ol Eucalypt	
	Ol Terabinth āā	... m 3
	Lanolin	.. oz. 1
or	Ol. Citronella	. . 18 25 per cent
	Camphor	1 0 ,,
	Cedar-wood Oil	. . 9 0 ,,
	Paraffin Durum	... 26 25 ,,
	Paraffin Molle (White)	... 45 0 ,,

The paraffin should be melted, other constituents rapidly stirred in and cooled rapidly in water and bottled It is also useful for mosquitos

ORIENTAL SORE

Local Applications—A 2 to 4 per cent potassium antimonyl tartrate ointment or powdered sulfonamide incorporated in dressings is valuable Carbon dioxide stick is of immense value It is applied directly to the sore and held there for 2 minutes by the clock The resulting blister is cut and a zinc dressing applied Penicillin powder, 100,000 to 200,000 units is recommended by Gutch (1947). It is sprinkled uniformly and a gauze strip impregnated with petrolatum placed over the wound A pressure dressing is applied and patient seen daily.

Parenteral Therapy—In single or few early sores and non-ulcerating lesions, berberine sulphate is recommended, a 2 per cent solution is injected into the indurated area surrounding the ulcer About 6 injections are needed to infiltrate the whole circumference of the ulcer; 1 c c is sufficient for an average sized ulcer Three to six treatments at weekly intervals will effect a cure Not more than 2 or 3 sores should be treated at one sitting Treatment is not suitable if many lesions exist Early lesions treated by this method heal without leaving a scar.

If lesions are numerous, neostibosan, urea-stibamine or fouadin injections should be given. Fouadin is perhaps the most satisfactory. The dose is 1 5 to 5 c c; intramuscular injections should be given on alternate days for 8 to 10 injections

RELAPSING FEVER

General and dietetic measures are similar to other febrile diseases: bed rest, liquid diet, oral hygiene and care of the skin and bowels. Patients must

be warned of the serious danger of collapse and heart failure during early intermission period

Specific Treatment—Neoarsphenamine injection intravenously is almost specific The dose for an adult male is 0 45 G and for a female 0 3 G One injection is usually enough Injection must be made during the pre-critical stage when the temperature is rising. If an injection is given near the crisis, collapse may occur Injection must not be made during an apyrexial interval Three hourly injections of penicillin early in the paroxysm are also of great value

RAT-BITE FEVER

Two similar diseases both often following a rat-bite, are known as rate-bite fever. One also called Sodoku is caused by spirillum minus, the other also called Haverhill fever is caused by streptobacillus moniliformis Both are characterized by a local lesion, regional adenitis, intermittent fever and rash

Prophylaxis—Apply pure phenol to the wound by a match stick swab, wash this out with water, put powdered sulfanilamide into the wound and dress

Specific Treatment—Neoarsphenamine is of value in the spirocheatal type 0.4 G to 0 6 G are given intravenously in 10 c c of distilled water Usually two injections at intervals of 5 days will effect a cure, rarely a third injection may be required

In the bacterial type arsenicals are valueless Penicillin in doses of 40,000 units intramuscularly every 3 hours for 7½ days, as in syphilis has been found effective

WEIL'S DISEASE

The disease occurs in this country most frequently during or after the rains The causative organism is Leptospira Icterohemorrhagica The reservoir of infection is the rat (rats contaminate soil, water and food with infected urine)

Treatment—General measures are the same as in other fevers. strict bed rest, fluid diet at first, increased very slowly during convalescence, oral and skin hygiene and care of the bowels. Symptoms are treated as they arise. For toxemia intravenous glucose is injected, for pruritus spt. of camphor is applied locally

Specific Treatment:

1 Aureomycin:
   1 Gm orally every 6 hours,
2. Penicillin
   100,000 units every 3 hours intramuscularly.

YAWS

Yaws or frambesia is caused by treponema pertenue It is a tropical disease closely related to syphilis. It is characterized by various skin lesions and relative freedom from the more severe visceral complications.

Treatment—The arsphenamines are specific. Three or four injections of 0 45 to 0 6 G. are given at weekly intervals Local treatment of the lesions is scarcely necessary.

Recently penicillin has been used with success

PHLEBOTOMOUS FEVER (Sandfly Fever)

There is no specific treatment The treatment is on general and symptomatic lines: bed rest, calomel and saline, liquid diet and analgesics like aspirin or phenacetin Manson Bahr considers opium a specific and recommends liquor opii sedativus in 30 minim doses

SEVEN DAY FEVER OF JAPAN

A mild leptospiral disease due to leptospira Hebdomadis The reservoir of infection is short-eared field mouse

Treatment is on general lines and symptomatic as for any mild febrile disease

DENGUE

It is a virus disease. The vector is aides There is no specific treatment at present The treatment is on general and symptomatic lines bed rest, calomel and saline, care of the bowels and skin, etc Hyperpyrexia is treated by use of ice cap, tepid or cold sponging, sleeplessness by bromides and chloral or soneryl; pain by analgesics like aspirin or sandon Local analgesic ointments for joint pains may also be used Suitable ones are iodex with methyl salicylate (M & J.) and Eutheria (Bengal)

YELLOW FEVER

Fortunately the disease has so far not appeared in India but there is no guarantee that it will not do so in future as the aides collected in this country have been shown to be capable of transmitting the infection Antiamaryl measures in Khartoum or Cairo and again before passengers disembark at Karachi and satisfactory preventive inoculation of persons from yellow fever area are at present rigidly enforced. The dose of the vaccine is 0 5 c c for an adult and 0 25 c.c for a child under 12 years, only one injection is required

Treatment—There is no specific The treatment is on general and symptomatic lines. The patient should be kept in a mosquito net night and day during the first three days and the attendants inoculated General measures include bed rest, an early purge (¼ grain doses of calomel ½ hourly up to 1½ grain), avoidance of later purgatives, hydrogen peroxide gargles to prevent stomatitis, liquid diet, plenty of glucose, and alkalies by mouth and intravenously The following prescription is of great value

R Liq. Hydrarg. Perchlor.	... m.	12
Sod Bicarb	... gr	6
Aq. ad.	... oz	1

Take hourly.

Vomiting—Ten minims of adrenalin chlor. 1 in 1,000, in an ounce of water or a ½ grain of cocaine in an ounce of water are of help In black vomit liquor feri perchlor. in 15 minim doses is repeated.

Hyperpyrexia—Useful measures are ice cap, tepid or cold sponging

Restlessness—Bromides 20 grains or phenobarbitone 1 to 3 grains are administered.

Anuria—This will require dry cupping to the loins, hot fomentations, warm colon washes and a warm citrate saline bladder wash in addition to glucose and sodium bicarbonate intravenously

PLAGUE

Treatment consists in the exhibition of sulfathiazole in full doses and general and symptomatic measure.

General and Symptomatic Measures—Strict bed rest, good nursing, hydrotherapy, fluid diet (imperial drink, barley water, glucose water), intravenous glucose For generalized restlessness phenobarbitone gr. 1 to 3 should be given If this fails morphine ½ grain should be judiciously given For collapse caffeine sodium-benzoate, camphor in oil or coramine will be required

Local Treatment—In early stages the buboes should be painted with glycerine and belladonna and fomented frequently or infra-red rays applied t.i d On no account should buboes be opened until they are definitely pointing, when they should be evacuated and dressed with sulfathiazole powder.

Specfic Treatment—Sokhey's anti-serum is given in an initial dose of 50 to 100 c c , the dose is repeated daily until temperature is normal. During a recent epidemic (1946) of plague in Kanpur the serum was employed in a number of cases which failed to respond to sulfonamides None of the cases that failed to respond to sulfonamides, responded to treatment with serum.

Sulfonamides—Sulfathiazole is given in an initial dose of 2 G. The dose is repeated in 4 hours and then every 6 hours day and night Sulfadiazine may be used instead of sulfathiazole In the 1946 epidemic in Kanpur success was obtained in over 80 per cent of the cases that were put on adequate doses of sulfathiazole.

Penicillin was tried but was found to be of no value Streptomycin, however, has received an extensive trial and has been proved to be of value The dose is 1 Gm. intramuscularly every 8 hours Streptomycin and sulfonamides may be used in combination

Prophylaxis—The principal measures are isolation and treatment of the sick, use of masks by attendants to prevent droplet infection from pneumonia cases, disinfection of clothes and houses and cremation of dead.

Mass inoculation of all the residents with Haffkine vaccine should be undertaken An adult is given 1 c c. of the vaccine subcutaneously and the

dose is repeated after a week. For those who will take only one dose 2 c.c may be given at once but the reaction is severe. In children the dose should be proportionately small.

Rat-proofing of grain stores and houses, keeping domestic cats and rat destruction by trapping and drowning in phenyle, by use of rat poisons such as barium carbonate pills (barium carbonate 3 parts, flour dough 4 parts) and gasing (cyanide gas or sulphur dioxide gas) are other important measures for control D D T. will prove effective in destruction of fleas

Undulant Fevers

The causal organisms are brucella mellitensis, brucella paramellitensis and brucella abortus.

General and Symptomatic Treatment—The patient should be kept in bed during the febrile stages and carefully nursed The mouth should be kept clean by frequent gargling and the skin by sponging. The bowels are kept open by liquid paraffin and enemata The diet should be liquid when the fever is high, otherwise the patient should be encouraged to eat Hyperpyrexia is treated by hydrotherapy, joint pains by aspirin, local applications of heat and physiotherapy (infra red), restlessness and insomnia by phenobarbitone, and severe toxemia by intravenous glucose For cardiac embarrassment caffeine sodium benzoate, coramine or cardiazol are indicated.

Specific Treatment:

1 *Aureomycin*—Aureomycin appears to be the drug of choice The drug is administered orally and 50 mg given on the first day On the second day 50 mg is given twice daily and on the third day three times a day Thereafter 0·5 to 1 G. doses are given every 6 hours for a fortnight Small initial dosage avoids Herxheimer-like reaction, or

2. *Chloromycetin*—The drug is given by mouth The initial dose is 60 mg per kg body weight. Thereafter 0 25 Gm. is administered every three hours until the patient is afebrile for seven days, or

3 Dihydrostreptomycin 0 5 Gm i m every 6 hours for two weeks is combined with sulfadiazine 1 Gm. every 6 hours

Prophylaxis—This consists of:

1 Destruction of infected dairy animals;
2 Immunization of susceptible animals;
3 Pasteurization of all milk and milk products

Cholera

Chemotherapy—Streptomycin 1 Gm. every 6 hours i m. has been recommended. Napier and others reported good results from the use of poorly absorbed sulfonamides. Sulfaguanidine was used by them. Later workers have used

sulfathalidine and sulfadiazine Recently formol cibazol has been employed These drugs have been found to be valueless.

Saline Treatment—Two solutions are used, Roger's hypertonic saline and alkaline saline·

(*a*) Hypertonic saline consists of:

Sodium Chloride	...	120 grains
Calcium Chloride	...	4 grains
Distilled water	...	1 pint

(*b*) Alkaline saline consists of:

Sodium Bicarbonate	...	160 grains
Sodium Chloride	...	90 grains
Distilled water	...	1 pint

This solution is autoclaved to ensure sterility and to it is added from a previously sterilized packet sodium bicarbonate 160 grains

Intravenous salines are given in all severe cases with evidence of dehydration or collapse The amount to be given will depend upon the degree of dehydration This can be determined by taking blood pressure readings and Sp G of the blood The normal Sp G in Indians is 1,056 If it is found to be 1,058 to 1,060, 2 pints should be given, if 1,060 to 1,062, 2 to 2½ pints; if 1,062 to 1,064, up to 3 pints. During the first 24 hours, hypertonic saline and alkaline saline should be given in the proportion of 2 : 1. Later as acidosis develops the proportion should be reversed The rate of flow should be at first 4 ounces to a minute but as pulse returns it should be slowed down to 20 minutes to a pint

The needle must be sharp and with a short bevel. When it is not possible to give it by the needle, the open method should be employed. A tourniquet is applied. Under local anesthetic a small incision is made and a vein isolated by forceps dissection The closed forceps is then passed under the vein and a double strand of catgut drawn under it. The catgut is divided to provide two ligatures The distal piece is drawn down under the exposed vein and tied, ends being left long. The proximal piece is drawn up under the vein to the upper end. The fluid is now allowed to run through the cannula to expel all air. The vein is steadied by lower ligature and a nick made into it by a fine pair of scissors The cannula is inserted into the vein and the other ligature is drawn round the vein with the cannula inside it The flow of saline is started After the infusion is concluded, the cannula is withdrawn but the ligature not knotted or cut, in case a later infusion is required

General and Symptomatic Treatment—Saline treatment is the sheet anchor of treatment. Other measures, however, may be necessary.

Diet—The patient should be given at first free supply of glucose water or lemon barley If obtainable, *Dab* (green coconut water) is an excellent drink. Later arrowroot, albumin water, milk whey, fruit juice, meat extract may be gradually added In a week or so full diet may be permitted

Collapse—The measures that are of value are intravenous saline, injections of atropine sulphate gr. 1/75 morning and evening, pitressin 1 c c, percorten (Ciba) 5 mg, hot water bottles and massage

Anuria—The treatment includes use of intravenous saline, pitressin, desoxycorticosterone acetate, 5 per cent glucose, caffeine sodium benzoate gr 4, hot fomentations to the loins, dry cupping, hot colonic washes, intravenous sodium sulphate (1 89 per cent) by drip method, and distension of bladder with warm citrate saline (2 per cent citrate in normal saline). Injections of salyrgan 1 c.c have given good results in a few cases

Vomiting—Ten minims of adrenalin in an ounce of water or ¼ grain doses of calomel ½ hourly up to six doses are often of value

Hyperpyrexia—In the stage of reaction there may be hyperpyrexia, this needs cautious treatment by hydrotherapy.

Essential Oil Mixture—This is sometime successful in premonitary diarhea and is recommended only when other treatment is not available

R	Ol Caryphyl	
	Ol. Cajuput	āā .. m. 5
	Ol Juniper	.. m 15
	Acid Sulph. Dil	.. m 30
	Spt. Ether	

Half dram of the mixture is given in an ounce of water every 15 minutes up to a maximum of 6 doses.

Potassium permanganate pills or kaolin are not of much value in my opinion.

Prophylaxis—Cases should be isolated, fomites destroyed by burning and general sanitary measures attended to

Haffkine's vaccine ½ c c is followed after 10 days by 1 c.c. and confers immunity for 3 to 6 months

Drinking water should be boiled, unripe and overripe fruit, ice, ice-cream, melons, cucumbers, etc, should be avoided

AMEBIC DYSENTERY

Acute Attack—Emetine is the sheet anchor The patient must be strictly confined to bed. One grain daily is given into deep subcutaneous tissues for 6 days. After a rest period of 3 to 6 days the course may be repeated. In mild cases three injections in the second course will suffice.

As emetine hydrochloride has no effect on the cysts, a follow-up treatment with carbarsone or emetine bismuth iodide is indicated in all cases. Carbarsone is given in doses of 0 25 G. morning and evening for 10 days. Emetine bismuth iodide is given in 2 grain doses at bed time for 10 days. As the drug may cause nausea or vomiting, it is best given at 10 p.m., 3 hours after the evening meal and preceded by a dose of 1 to 2 grains of phenobarbitone or 15 minims of tincture opii. The treatment may be rounded off by giving one dram of liquid extract of kurchi three times a day and a dose of *isphagulla bhusi* at bed time for a period of 3 to 4 weeks.

A number of new drugs have been introduced in the treatment of amebiasis. Two such are garlicin and aureomycin. In addition to these, two thioarsenites (C C 914 and C C 1,037) are at present under investigation. The reported results with all four, are encouraging.

Diet—It should be at first light and liquid: glucose water, albumin water, skim milk, fruit juice and chicken broth; gradually light solids, milk puddings, half boiled eggs and boiled fish are added.

Toxic Effects of Emetine—Careful watch must be kept for toxic symptoms of emetine. These are myocardial degeneration, asthenia, fall in blood pressure, mental depression, desquamation of the skin, brittleness of the nails, myositis, neuritis and diarrhea.

Chronic Amebiasis—Emetine injections are useless. Manson recommended combined treatment with emetine bismuth iodide (E. B. I) by mouth and at the same time quinoxyl retention enemata for a period of 10 days. E. B. I is given in 2 grain pills (P. D & Co) at bed time. Vatren enemas or vioform enemas 8 ounces of a 2 5 per cent aqueous solutions are retained for 6 to 8 hours after a bowel wash in the morning with a 2 per cent sodium bicarbonate solution. The author recommends a course of carbarsone treatment (provided there is no hepatitis) after a course of combined treatment as outlined above.

Recently diodoquin a compound related to yatren has been used orally in doses of 3 tablets (3 2 grains each) three times a day with great success. It is given for 20 days after the combined treatment. It is said to be superior to arsenicals and other quinoxyl compounds.

HEPATITIS AND LIVER ABSCESS

Emetine injections (1 grain daily for 6 days) are indicated in presuppurative hepatitis and small abscesses. After treatment is as indicated earlier, under chronic amebiasis, *i e*, with E. B. I and quinoxyl enemata. If the condition does not respond to emetine, chloroquine 1 25 Gm. daily for a period of 18 days is highly effective.

If much pus has formed it should be aspirated with a Potain's aspirator or a long needle and 50 c c syringe. The site for puncture is selected from the physical signs; 8th and 9th spaces well below the pleura in the anterior axillary line are usually preferred. The needle is inserted upwards, inwards and backwards for not more than 3½ inches.

Open operation is indicated if after repeated attempts at aspiration pus is not obtained but indication of its presence are too strong to be ignored, when abscess points in the epigastrium (left lobe abscess) and when large amount of pus is present, is secondarily infected and does not yield to aspiration

Giardiasis

Infection with lamblia may give rise to diarrhea, abdominal pain and occasionally a sprue-like syndrome, with marked anorexia, sore tongue, macrocytic anemia and a fatty diarrhea. Irritability and anxiety may also be present

Treatment—Atebrine 0 1 G t i d. for 5 days is effective A second course after a week's interval will be required in a few cases Stovarsol (M & B), a tablet t i d has also been used

Balantidiasis

Infection with Balantidium coli may give rise to symptoms resembling amebic dysentery. The condition is usually very persistent Anemia is a marked feature

Treatment—The following measures are recommended emetine 1 grain daily; methylene blue in 2 grain pills and as an enema (1 in 3,000) , or dram doses of carbon tetrachloride

Ulcerative Colitis

Ulcerative colitis is a very refractory condition The customary treatment consists of colonic washes with 2 per cent sodium bicarbonate followed by retention enemas of sulfadiazine or sulfathalidine Recently Bargen (1949) has reported very encouraging results from the use of salazopyrin (salicylazosulfapyridine) in this disease as well as regional enteritis The dose recommended is 1 5 Gm orally, every three hours for two weeks

Successful treatment of this disorder is also reported from the use of aureomycin Initially 250 mg dose is given every 8 hours If improvement does not occur in a week, the dose is doubled.

Sprue

Treatment consists of the following measures.

1. *Rest in bed*

2 *Suitable Dietary*—The author has found a diet of butter milk (*matha*) eminently suitable for Indian patients Three pints of butter milk are gradually increased to 4 or 5 pints over a period of one month During the first 14 days the butter milk is taken after the butter has been removed from the *dahi* or the curd Later, and, if the stools improve the whole *dahi* is drunk Butter milk is supplemented by fruit (apples and bananas) eight ounces daily and 1 to 2 ounces of glucose.

After the first fortnight and as improvement takes place, other articles of food such as very small helpings of well baked chapatee, a tablespoon of well cooked rice, a little dal, steamed fish, egg or chicken, etc., can be gradually added

Sprulac may be used in cases where butter milk is not agreeable. It is a proprietary food with low fat content Six ounces of dry sprulac a day are gradually increased to 15 ounces Fruits (apples and bananas only) are given in addition.

3 *Treatment of Deficiencies:*

(*a*) Parenteral crude liver extract 4 c c on alternate days;
(*b*) Nicotinic acid 150 mg daily;
(*c*) Riboflavine 3 to 5 mg. daily;
(*d*) Iron (Coliron, Evans) by mouth;
(*e*) Basic tripple phosphate of calcium in dram doses t.i d ;
(*f*) Supra-renal cortical extract (percorten 5 mg. twice weekly);
(*g*) Folic acid has been used with good results but its use is now being condemned;
(*h*) Vitamin B_{12}.

4 *Symptomatic Treatment:*

(*a*) Diarrhea:

℞ Bismuth salicylate ... gr. 20
Dover's powder ... gr. 5
Two or three times a day as required

In obstinate cases a course of sulfasuxidine, sulfaguanidine or sulfadiazine may be tried

(*b*) Indigestion: An acid stomachic mixture should be given ½ hour after food.

Hill Diarrhea

Treatment consists of:

(1) Abdominal flannel binder to prevent chills;
(2) Drinking boiled water;
(3) Suitable soft diet;
(4) Sulfadiazine by mouth;
(5) Acid mixture

Classical treatment was liq. hydrarg. perchlor. sixty minims in water three times a day after food If none of these measures succeed the patient must be advised to leave the hills

Leprosy

As in other chronic diseases a very important part of treatment consists in improving and maintaining the general health of the patient. This is done by means of nourishing diet, regulated life, treatment of any complicating diseases that may be present

Apart from the general consideration the treatment of leprosy may be considered under two main heads: (I) specific treatment aimed against the disease and (II) treatment of special symptoms and complications.

Specific Treatment—Uptil now the mainstay in the treatment of leprosy were injections of hydnocarpus oil and its preparations. Within recent years, however, the sulphone drugs have marked a great improvement in this field

The parent compound of this group is diamino-diphenyl sulfone (DDS). There are various derivatives from this parent compound, the most well known of which are promin, diasone, sulphetrone. Promin was the first preparation to be used, but since it has to be given intravenously and is too toxic by mouth, it is no longer popularly used. The doses and mode of administration of the other preparations is as under.

Diamino-diphenyl Sulphone—It is given by mouth in very small doses ... uly and after a few weeks the ... twice daily) In general the ... except under expert advice

Diasone (Diamidin)—Treatment should be started with 1 tablet (1/3 Gm), and in the course of few weeks raised to 3 tablets a day

Sulphetrone (Novotrone)—Sulphetrone is very poorly absorbed from the gut, it is therefore better to give it intramuscularly For oral treatment, one tablet (½ Gm) is given three times a day and the dose is gradually increased to two tablets 3 times a day. For the intramuscular route, a 50 per cent solution of sulphetrone in water is used, and injections are given twice a week, beginning with ½ c c. and gradually raising the dose to 4 or 5 c c Under sulphone treatment there is seen definite clinical improvement within six months to an year, bacteriological ... may take four or five years ... The most marked clinical ... the lesions of nose and eyes ... ide and flatten out, and in

The sulphone drugs have a tendency to produce anemia treatment with them should therefore be regulated by periodic blood examination, and hematinics should be used when indicated

When the doses recommended above are adhered to, no serious toxic symptoms are met with. Minor toxic symptoms such as nausea, feeling of weekness, burning sensation of hands and feet may be experienced by some patients in the beginning but they disappear as the treatment is continued Sometimes an acute flare up of the disease may be seen and in that case the treatment should be suspended Drug dermatitis is not infrequently seen, but it responds well to anti-histaminic drugs like antistine, pyribenzamine, etc

In cases of oral administration treatment should be given on six days a week, and treatment for 6 weeks should be followed by rest for a fortnight In case of the intramuscular administration, two weeks' rest should be given after treatment for 3 or 4 months

Streptomycin and Dihydrostreptomycin—An i m dose of 1 Gm of streptomycin/day has been found useful as an adjunct to the sulphones Dihydrostreptomycin has now replaced it, and although this has shown a rapid effect on the mucous membrane and early eye lesions particularly in case of retarded response to sulphones, its chronic toxicity limits its usefulness to that of an adjunct to sulphone treatment, where it produces an enhancing effect

Aureomycin—1 0 to 1 5 Gm /day orally for 1 year has produced good results so far in 5 cases A further trial is awaited

Amithiozone (Tibione)—The early results with 200 mg /day in 5 patients are so promising (rapid improvement, but too early to determine its effect on the bacilli) that, if confirmed, this will in the author's opinion become one of the most promising leprosy drugs, beside the sulphones

Control of Leprosy—To check the spread of leprosy it is necessary to isolate all infective cases in leprosy institution, village isolation centres or in patients' own homes Extensive use of sulphone drugs in the treatment of leprosy is likely to contribute towards the control of the disease by decreasing the infectants and ultimately making the patients non infective

CHAPTER VIII

DISEASES DUE TO PARASITIC WORMS

Bilharziasis

The treatment of schistosomiasis has so far been by intramuscular or intravenous injections of antimony compounds. The introduction of a new drug which will effect a cure and can be given by mouth is, therefore, an advance of no mean value Miracil D (Nilodin), a fine yellow powder (hydrochloride of I-methyl-4-B-diethylaminoethylamino-thioanthone)-a thioxanthone derivative was first synthesized by Mauss in the I G. Farben at Elberield Subsequently satisfactory results were obtained by W. Kikuth in mice infected with both common species of schistosoma-S hemotobium and S mansoni. The effective dose of miracil D is 18 to 20 mg per kg. body weight daily by mouth for 7-8 days and the serum concentration must reach 0 3 mg per cent. When smaller doses are given the drug is not effective.

Toxic Reactions—In man when given by mouth, it appears to have singularly few untoward reactions

Hawking and Ross (1948) state that the drug has an irritant action on the tissues and causes pain, inflammation and necrosis at the site of injection It is more toxic when given intravenously and may produce venous thrombosis

Indications for cure include disappearance of viable ova from the urine and feces, the cessation of hematuria and obvious improvement in the physical condition of the patient

Filariasis

The medicinal treatment of filariasis has been so far extremely unsatisfactory. The announcement, therefore, by Welch et al of a new chemotherapeutic agent which when injected into infected cotton rats and dogs kill the microfilariæ, was not only received with mixed wonderment and disbelief, but also infused fresh hope into enthusiastic workers to try this new drug in the treatment of human filariasis

Hetrazan—Santiago Stevenson, Oliver Gonzalez and Redginal Hewitt report on the use of hetrazan in the treatment of filariasis bancrofti. The data presented show that the drug when given by mouth causes a rapid disappearance of microfilariæ from the blood, and has possibly also an action on the adult worms They treated 26 patients (1947), 20 males and 6 females, all puertoricans with hetrazan Twentythree of these patients were asymptomatic but had positive

night smears for microfilariæ The three remaining ones had symptoms of clinical filariasis and also had microfilariæ in the peripheral circulation at night

The drug was administered orally three times a day or every eight hours. Duration of treatment was from 3 to 21 days Ten patients were given 2 mg per kg three times a day, two received 0 5 mg per kg three times a day and the rest 1 mg per kg three times a day.

In a more recent report (1948) the same observers describe their experience of a larger series of 74 patients, 54 males and 20 females Four exhibited clinical symptoms, the remainder were asymptomatic. In the majority of these patients, regardless of the dose used there was a marked reduction of microfilariæ within 2 to 4 days of the commencement of the treatment.

The drug was well tolerated in all instances and the side effects were few and never severe enough to warrant discontinuation of treatment The following were the most frequent reactions fever, headache, general malaise, lumbar ache, anorexia, nausea and vomiting, painful nodular swellings, aching joints, weakness, cutaneous manifestations, pain in testes, shortness of breath and abdominal pain

Hawking (1948) and Stefanopoulo and Schnieder have reported on the successful use of hetrazan in the treatment of Loa Loa Hawking treated two patients and Stefanopoulo and Schnieder 20 adults from South Africa infested with Loa Loa Fortyeight hours after the commencement of treatment the edematous swellings decreased and then disappeared The pruritus was strikingly relieved. The microfilariæ disappeared rapidly from the blood

Surgical Treatment—In early cases of the disease the need for surgery is minimized if hetrazan is used in adequate doses

In cases of standing surgery may be combined with hetrazan

The rest of the treatment is symptomatic

Dracontiasis

Phenothiazine—It is specific for D Medinensis. Four Gm. of phenothiazine emulsified with adeps lanæ and olive oil are injected intramuscularly at weekly intervals. Two treatments are sufficient One Gm in 10 c c is injected some distance above and 1 Gm. below the site of the worm One Gm is injected in the vicinity of the buried worm The site of injection is previously anesthetized by novocaine solution After 5 to 7 days the worm can be extracted by the rolling stick method.

In massive induration or sinus formation, the injection is made directly into the area. The sinuses dry up and the worm can be massaged out.

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empty stomach and no food allowed for 4 hours at the end of which a saline purge is administered

Hetrazan—The dihydrozen citrate salt of hetrazan 6 mgm. per kg body weight three times daily for at least a week is effective in removing ascarids in children without the use of a purgative or resort to fasting

Ankylostomiasis

The following drugs are employed :

Tetrachlorethylene—It is safer and more effective than carbon tetrachloride The adult dose is 3 to 4 c c. given well shaken in 2 ounces saturated solution of mag sulph It may be combined with ol chenopodium as follows Tetrachlorethylene 3 c c , ol. chenopodium 1 c c , saturated mag sulph solution 2 ounces The patient should take light food on previous evening and no breakfast on the day of treatment.

Carbon Tetrachloride—The adult dose is 1 dram and is given in gelatin capsules Sodium sulphate ½ ounce is given 15 to 30 minutes later Alcohol and absorbable fats must not be given for some days before and after treatment Castor oil must not be given

Ol Chenopodium—The adult dose is 3 c c followed in ½ to ½ hour by sodi sulph ½ ounce

Combined Treatment—This consists of the following routine On the previous evening a light meal is given No breakfast is allowed At 8-30 a m 2 capsules containing 8 minims each of ol chenopodium are given , at 8-45 a m 4 capsules each containing 10 minims carbon tetrachloride are administered and at 9 a m mag. sulph. 1 ounce in water

Hexylresorcinol—Gelatin capsules containing 0 5 G are given For children under 6 years the dose is 1 capsule, between 6 to 8 years 2 capsules, between 8 to 12, 3 capsules and for adults 4 to 5 capsules No food must be allowed for 4 hours after treatment; at the end of this period a saline purge is required.

After Treatment—Prolonged iron therapy with ferrous sulphate tablets is necessary to correct the anemia.

Oxyuriasis

1 *Diphenan*—One to three tablets a day for children over 10 and adults The course consists of 20 tablets The bowel should be washed with salt and water enema and 6 ounces of 10 per cent quassia infusion run in

2. *Hexylresorcinol*—The dosage is similar to that described under ascariasis

Soap and water enemata followed by a 1 in 2,000 enema of hexylresorcinol (2 pints in adults, in children to the limit of tolerance) is effective and should be repeated every 2 weeks.

The older treatment consisted of repeated applications of cold water to the site followed by gradual winding of the worm on match stick. Injections of 1 in 1,000 mercuric chloride into the site are also followed by the death of the worm which can be then extracted.

Prophylaxis—The wells or drinking water should be protected from pollution by guinæ worms. In Mysore introduction of barbed fish which feed on cyclops has proved effective Wells should be disinfected every 14 days. Drinking water should be boiled or filtered through fine muslin.

Fasciolasis

In Assam about 50 per cent of the population is infected with F Buskii.

Treatment—Any one of the following drugs may be used and is effective

1 B-naphthol ... gr. 10
2 Ol Eucalypti ... m. 3
3 Carbon Tetrachloride ... dr. 1
4 Hexylresorcinol 0 4 G for children under 7 and 1 G for those above 12 years

Clonorchiasis

The treatment is unsatisfactory. The drugs employed are:

Fouadin—Intravenous injections of fouadin 1 5 to 5 c c Ten or more injections are required

Gentian Violet—Twenty c c of a 1 per cent solution are injected intravenously followed by 30 c c on the fourth day.

Paragonimiasis

The treatment is unsatisfactory. Emetine injections 1 grain daily for six days are recommended Good results are reported from use of sulfonamides.

Ascariasis

The most used drugs are santonin, hexylresorcinol, and hetrazan

Santonin—The adult dose is 1 to 3 grains and is given with calomel at bed time In the morning a dose of saline should be given. The treatment may be repeated for 3 consecutive nights. In children the dose of santonin is proportionately smaller, for a baby of 1 year 1 grain and for a child of 12 years 2 grains

Hexylresorcinol—The drug is more efficacious than santonin. The dose is 2 to 4 (0 15 G.) capsules for a child and 5 to 7 for an adult. It is given on an

CHAPTER IX

DISEASES DUE TO PHYSICAL AGENTS

DIVER'S PALSY

Prophylaxis—Fat persons or those suffering from diseases of the heart, lungs or kidneys, or men addicted to alcohol must not be employed for caisson work Inflammation of the eustachian tubes is also a contra-indication. Men should not work longer than a 1 hour shift at a pressure of + 50 pounds, longer shifts are permissible for lower pressures When working at increased pressure, decompression must be gradual The men pass through a series of air locked chambers, where the pressures are gradually lowered, a due stay being enforced in each chamber. Exercise and inhalation of oxygen are also important during decompression.

The patient should be placed in a chamber, "medical air lock," and the pressure raised to that at which he was working After half an hour he is very gradually decompressed. If no chamber is available, the patient may be lowered to the pressure at which he was originally working, and gradually brought to the surface If this is not possible oxygen and morphine should be administered

MOUNTAIN SICKNESS

As the disease is due to anoxemia, a portable oxygen apparatus should be used at high altitudes

SEA SICKNESS

The treatment is applicable to sickness occurring on the sea, in a train, a car or an aeroplane.

A meal rich in carbohydrates should be taken before the journey, and the blood sugar kept up subsequently by eating lump sugar at the earliest appearance of symptoms. Fats should be avoided Sedatives such as chloretone gr 5 in a cachet or capsule, may be taken twice a day The sufferer should keep warm, have plenty of air and lie down

Trotter (1946) reports excellent results from the use of hyoscine as a preventive; hyoscine 0 6 mg protects half the patients and 1 2 mg nearly three-fourths It should be given half an hour before rough weather is encountered. For short voyages of a few hours' duration one dose is ample, for long voyages the daily dose of 1.2 mg should be split as follows half an hour before breakfast 0.6 mg, half an hour before lunch 0 3 mg, half an hour before supper 0 3 mg If vomiting is extreme the first dose of 0 3 mg to 0 6 mg may be given parenterally. The treatment is equally good for car journeys over winding mountain roads

HEAT DISEASES

For purposes of therapy, cases are divisible into two groups:

1. Those without shock or circulatory failure (heat prostration, muscle cramps or spasms due to salt deprivation)

2. Those with circulatory failure or shock present or impending (heat exhaustion, heat stroke) In milder cases of group I, generally complaining only of weakness, headache, nausea and malaise, sedation is promptly given. Bromides, phenobarbitone or sodium amytal are given by rectum or injection to avoid nausea. An ice-cap is provided for the head. A tap water sponge-bath is given and increased ventilation over the exposed surface of the body is secured by electric fans An increased intake of fluids and salt in the form of saline water (0.1 per cent) cooled to 50 degrees is forced orally If nausea and vomiting were present, 1 litre of 0.9 per cent saline is injected slowly intravenously or hypodermically depending on the individual indications of a particular case.

If the rectal temperature is over 102°F. the skin surface of the trunk and extremities is sprayed at 5 minute intervals with a fine mist of tap water spray and increased evaporation effected by directed air currents from electric fans. The temperature is checked every 15 minutes, while spray is in use For temperatures below 102°F. spray should not be used.

In more severe cases 500 c.c. of plasma is given intravenously at once and repeated in 30 to 45 minutes if B P. response is not satisfactory

2. Hundred per cent oxygen is given by mask

3. Extremities are massaged to stimulate circulation.

4. Circulatory stimulants are given in addition to restore adequate circulation. Suitable ones are pholedrin, methedrin, caffeine, metrazol, etc.

FROST BITE

Prophylaxis—Adequate woollen clothing, gloves, stockings, ear flaps are important. The boots should be supple and well fitting.

Treatment—If a part, hand or foot becomes numb or the nose goes white, the affected part should be warmed by taking off the boot or glove and placing the hand or foot between the thighs or under the arm of a friend. The nose should be warmed between the hands. In more advanced cases local application of heat in any form must be avoided, and friction (including rubbing with snow) must on no account be applied. The parts should be cleaned gently with gauze soaked in 1 in 1,000 acriflavine, carefully dried and covered with sterile gauze and several layers of wool.

General Treatment consists in combating shock an[illegible] drinks. If the body temperature is below normal, the b[illegible] with hot water bottles, which must not be placed near t[illegible] cases which occur at great heights oxygen is of great val[illegible]

be required for gangrene but should be delayed as long as possible, as partial recovery is likely.

BURNS

The treatment may be described under two heads general and local.

General Treatment—The real problem in severe burns lies in treating the systemic disturbances Burn patients die not of their burns, but of shock, toxemia or sepsis When possible, these complications must be prevented, or, if present, must be recognised promptly and treated The surgeon must not wait for appearance of prodromal signs of failing blood pressure, rising pulse rate, increased blood nonprotein nitrogen, diminished urinary output, thirst, restlessness and nausea before instituting treatment

Primary or psychic shock at the time of the burn could not be prevented, but pain and apprehension are relieved by sedation with morphine

Plasma has been almost a specific in the treatment of burns Need for early administration in the prophylaxis of secondary shock is the most fundamental principle of shock therapy. The amount of whole plasma is regulated by extent of the burn, by clinical response including blood pressure and pulse rate, and by use of laboratory aids When 1 per cent of the body surface is burned, no plasma is required, when 5 per cent or more is burned, 100 c c plasma for each 1 per cent every 24 hours is indicated, and when 20 per cent or more is burned, the same proportion of plasma with oxygen is needed Oxygen is important in treatment of shock, to relieve anoxia

Local Treatment—There is no accepted method for local treatment of burns Henry N Norkins (1945) discusses present theories of burn management The use of tannic acid was popular from its introduction in 1925 until 1938, when its safety began to be questioned Now that it is no longer used three other methods deserve mention Of these pressure dressing is the most popular. The second, plaster cast, is a modification of the pressure dressing technic and utilizes the same principle The third, the Bunyan bag method, is chiefly chosen in England

Pressure Dressing—When the burn is first seen it should be covered with sterile sheets or towels without other medication until definitive dressing can be carried out Burns are not debrided except under special circumstances In use of pressure dressing technic, a fine mesh gauze is placed on the burn without rupturing the blisters This plan is justified by absence of bacterial growth in cultures of blister fluid taken at intervals after the burn The outer wall of intact or ruptured blisters acts as a protective membrane The nature of the fine mesh gauze to be placed over a burn or its unruptured blisters is largely an acedemic problem, vaseline, xeroform, sulfonamide, penicillin, plain dry or saline gauze may be used John G Stubenbord (1945) reports that the healing time in days with tannic acid was 7 0 days, with sulfonamide ointment 4 1 days, with cod liver oil ointment 3 1 days, with 5 per cent boric acid ointment 2 5 days and with petrolatum only 2 days Boric acid ointment may lead to toxicity in extensive burns, while absorption of too much sulfonamide

may occur if a water-base sulfonamide ointment is used. It thus seems logical that the simplest and blandest covering is the best.

Over the fine mesh gauze should be placed a liberal amount of mechanic's waste, and the final layer of the dressing should be formed of an elastic bandage, to exert uniform pressure. Such pressure can be accomplished easily over the extremities and over the face and head. Over the trunk of large subjects such a dressing is difficult, but it is always possible. Such a dressing should preferably not be changed for 10 to 14 or even 21 days

After removal of the dressing the burned surface should be prepared for grafting as soon as possible One advantage of pressure dressings is that fewer burns require grafting

CHAPTER X

METABOLIC DISEASES

DIABETES

The diabetic individual has difficulty in metabolizing food, especially carbohydrate food He should, therefore, be given just enough food to give him energy for his particular work and to maintain him at his ideal weight or slightly less All superfluous food must be cut out

In pre-insulin days carbohydrates used to be severely restricted Now-a-days a more liberal ration is permitted This makes food more appetizing, increases sensitivity to insulin and promotes endogenous insulin production An average diabetic in this country requires from 115 to 160 G of carbohydrate daily His protein requirements are in the neighbourhood of 1 G for every kilo of the body weight

Calculation of Diets—For basic needs and light work in this country a diabetic requires approximately 25 calories per kilo body weight A man weighing 140 lbs or 64 kilos will, therefore, require 64 × 25 or 1,600 calories per day These can be split up as follows

Carbohydrates	115 G or 471 5	calories
Proteins	64 G or 246 0	,,
Fats	100 G or 900	,,
Total ...	1617 5	calories

A suitable diet for a non-vegetarian in North India containing approximately 1,600 calories is given below

Breakfast:		C	P	F	Calories
Bread	... 1 oz	14 9	2	0 2	72
Butter	.. ½ oz	..	.	12	108
Egg	... One	..	7	7	90
Tea	.. ..		..	...	..
Milk	.. 2 oz	2 8	1 8	2	40
Lunch.					
Chapatis	.. 1½ oz }	29 5	3 5	1 5	150
or Rice	... 2 oz }				106
Butcher's meat	.. 2 oz	..	12	6	100
Dal	.. 1 oz	15 9	6 7	0 7	80
Dahi	... 4 oz	5 6	3 2	4 0	223
Ghee	... 1 oz	...	...	24	40
Orange	... 3½ oz	8 75	...	...	

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Dal	... 1 oz	15 9	6 7	0 7	100
Dahi	.. 4 oz	5.6	3 2	4 0	80
Ghee	... 1 oz	...	...	24	223
Orange	... 3½ oz.	8 75	...	...	40

Food Stuffs :	C	F.	P	Calories.
Mushrooms	2 0	0 1	1 0	13
Patal (Pulwal)	0 4	traces	0 2	3
Peas, green	5 6	,,	2 0	31 4
Spinach (Palak) ...	0 8	,,	0 5	6
Tomato	1 3	,,	0 6	8
Vegetable marrow (Loki) ...	1 2	,,	0 1	6
Carrot	3 1	,,	0 3	14 1
Onions ...	3.3	,,	0 3	15
Potatoes	5 3	0 1	0 5	25
Raddish (Muli) ...	1 2	traces	0 2	5
Turnips (Shaljam) ..	2 1	,,	0 1	10
Apples (ordy)	3 8	,,	0 1	23
Apples (kulu)	5 0	0.1	0 2	26
Guava	4 1	0 1	0 4	19 4
Leechee	1 9	traces	0 8	11
Mango	5 1	0 2	0 5	20
Melon musk (Kharbooza)	1 9	traces	0 6	10
Orange	2 5	,,	0 1	11
Papaya	2 7	,,	0 1	12
Peaches	2 2	0 4	0 1	12
Pears	3 6	0 1	0 3	17
Plums	4.1	...	.	17
Almond (Kagji) ...	3 0	16 7	5 9	192
Cashew (Kaju).. ..	6 3	13 3	6 0	174
Pistachios	4 6	15 2	5 6	183 2
Walnuts	3 1	18 3	4 4	201
Kishmish	22 0	0 1	0 5	93 2
Dates	19 1	traces	0 9	83 0

Diet Exchanges—Two ounces of meat may be exchanged for 2½ oz liver or fish; one egg may be exchanged for ¾ oz meat, one ounce of bread for 2½ oz. of cooked potatoes or 1¼ oz cooked rice or 3½ oz of apple or 5 oz. of orange

Obese Diabetics—In mildly obese diabetics diet calories should be reduced to 1,400 a day, in gross obesity it may be necessary to cut down the daily calories to 1,000 to 1,200.

Insulin—If a diabetic person kept on a basic diet for a week or so still passes sugar in the urine, insulin is indicated in addition to a suitable dietary It is needed at once in the following types of cases in under-weight diabetics who pass acetone and considerable amount of sugar in the urine, in cases of coma or pre-coma; in diabetic children; in diabetics in whom surgery is necessary; and in cases complicated by infections and gangrene. Patients who cannot go up the dietetic ladder high enough without passing sugar in the urine also require insulin

Mild diabetes in old age can be managed on dietetic treatment alone

There are many kinds of insulin, the soluble or original insulin, the zinc protamine or Z P insulin, the globin insulin and the NPH 50 (Lilly) which has been introduced more recently. Soluble insulin should be given half an hour before meals Z P I which is given only once a day, should be injected half an hour before breakfast. Where it is necessary to use both insulins, the soluble is first injected and with the needle *in situ*, the syringe is detached and filled with Z P I. which is then injected in a slightly different place through the same puncture.

Ordinary insulin has a rapid and powerful but transient action, having its maximum action on blood sugar in from 2 to 4 hours The action wears off in about 6 hours Z P I. has little effect for 2 or 3 hours after injection; it becomes gradually effective and the maximum effect is obtained in from 8 to 12 hours When a large dose has been given its effect may last for 26 hours or more. For emergencies like pre-coma and coma, soluble insulin should be used For maintenance treatment of stabilized cases Z P. is the insulin of choice

Zinc protein insulin must not be given more than once in twentyfour hours Globin insulin may be used in cases in which there is an allergic sensitivity to PZI or those not satisfactorily controlled by it Its action is not so prolonged as that of P Z.I. and maximum effects occur more promptly For these reasons it has the theoretical advantage of eliminating the necessity for injection of a short acting and a long acting insulin at the same time in many cases Also it is not attended with the danger of insulin shock during the night, as its maximum effect following morning injection occurs during the day time and thus during the period of maximum hyperglycemia. Insulin reactions may occur, however, being most common between 4 and 5 p m In such cases patients should be asked to eat a light snack in mid-afternoon. Allergic reactions are uncommon after the use of globin insulin

During recent years insulin mixtures have been introduced for the treatment of diabetes with great success A mixture with 2 1 ratio, *i.e.*, 2 parts regular insulin and 1 part protamine will prove satisfactory in a great majority of the cases MacBryde (1947), reports on the use of modified protamine zinc insulin. M P Z has about one-half the protamine and zinc present in the market P Z I and is adjusted to pH7.2 According to MacBryde M P Z most nearly fulfils the requirements of an ideal insulin and it might well be substituted on the market for standard protamine zinc insulin, since it will control a much larger percentage of uncomplicated diabetes. Gabriele and Marble of Joslin Clinic and Wilder of Mayo Clinic consider NPH50 to be the best insulin on the market.

Management of a Mild Case—When a case of moderate severity kept on basal diet for a week still passes sugar in the urine, he is put on Z P.I. straightaway. Ten units are injected half an hour before the breakfast and the dose is increased 4 units at a time, 3 or 4 days being allowed to elapse between each increase in dose When the morning specimen becomes sugar-free, the dose of Z P I. should not be increased any further. If on this dose sugar is present

in the urine during day time a small dose of soluble insulin should be given in addition A few cases are definitely refractory to Z P.I.

Management of Severe Cases—When a patient with much sugar and acetone in the urine, first comes for treatment, soluble insulin is started at once A diet slightly below his maintenance requirements is allowed and insulin injections given ½ hour before morning and evening meals The initial dose will depend on the severity of the case If no urgency exists an average dose of 15 units in the morning and 10 units in the evening may be injected. Daily increases of 2 to 5 units may be made, though in urgent cases larger increases are necessary. When the patient becomes stabilized on soluble insulin and if the daily dose of soluble insulin is not more than 25 units, the same dose of Z P I may be given in a single injection before the breakfast If, however, the daily dose of soluble insulin required is larger, say 45 units, 2/3rd of this are replaced by Z P I and the remainder 1/3rd allowed as ordinary insulin Gradually it may be possible to reduce and eventually to abandon altogether the soluble insulin. With Z.P.I the carbohydrate should be distributed more evenly over the day.

Hypoglycemia—Hypoglycemic symptoms occur in a normal individual when the blood sugar reaches the level of 60 or 70 mg per cent, in a diabetic accustomed to high level of blood sugar symptoms of hypoglycemia may occur when the blood sugar is still 120 mg per cent Symptoms of hypoglycemia due to soluble insulin are: At first there is a feeling of weakness and emptiness about the pit of the stomach The patient feels weak, dizzy and experiences a strong desire for food This is followed by tremor, tachycardia and occasionally diplopia Clammy sweats are invariable Mental symptoms, and in advanced cases, muscular twitchings, deep coma and eventually convulsions ensue

With Z P.I hypoglycemic reactions are less numerous When marked reactions do occur with Z P I, they are severer than those after soluble insulin and more difficult to treat Hypoglycemia of Z P I also presents a different picture than that of soluble insulin Symptoms come on slowly and general malaise, nausea, vomiting and particularly headache are most commonly experienced Sweating, palpitation and tremor, characteristic symptoms of soluble insulin hypoglycemia, are less marked Patients should be warned of these novel symptoms of Z. P. I reactions

Treatment of Hypoglycemia consists in raising the blood sugar level by administration of carbohydrate. All patients taking insulin should carry some lumps of sugar. After taking sugar the patient should remain quiet till symptoms disappear A drink of water should be taken to facilitate absorption of sugar. If symptoms do not disappear two more lumps of sugar with some water should be taken. If sugar is not handy, orange juice, bread or other carbohydrate may be taken. Usually this is enough

In an occasional comatose case with inability to swallow, an injection of ½ c.c. of epinephrin (1 in 1,000) should be given. This mobilizes blood sugar into the blood stream and rouses the patient sufficiently to enable him to swallow

a solution of glucose An intravenous injection of 400 c c. of 10 per cent glucose or introduction of 2 oz of glucose in 10 oz of water by nasal tube into the stomach are measures that may be needed in an exceptionally severe case. Hypoglycemia due to Z P I may be prolonged and despite its having been treated, it may repeat itself owing to the continuing action of the dose administered It is, therefore, desirable to use a carbohydrate like bread and honey at the same time

Hypoglycemia occurs under the following circumstances:

(*a*) Patient's natural tolerance to carbohydrate has improved and his insulin requirement has diminished;

(*b*) Patient has taken unusual amount of exercise;

(*c*) He has missed a meal or taken too little of it;

(*d*) An overdose of insulin has been injected by error.

Diabetic Coma—If coma is moderate 50 units of insulin are injected subcutaneously After the initial dose at least 25 units of insulin are given 2 hourly as long as severe ketosis is present Specimens of urine should be procured and tested prior to each injection of insulin. Frequent estimations of blood sugar are ideal As dehydration and collapse are usually present 2,500—5,000 c c. of normal saline should be given intravenously and cardiazol, coramine or camphor in oil injected 2-hourly. When patient comes out of coma a light diet containing not less than 120 G of carbohydrate with a low fat content should be given for a day or two and three or four doses of insulin given daily according to need In severe cases where the patient is completely unconscious, the initial dose of insulin should be 80 units and half of this amount should be given intravenously Two pints of normal saline should also be run into a vein and if the patient is not roused sufficiently to be able to swallow this may have to be repeated later Glucose intravenously adds insult to injury Plasma or whole blood are useful in collapse. If the serum potassium level shows deficiency, potassium chloride (not more than 3 Gms daily) should be incorporated in the intravenous saline

Complications—The adequate treatment of the underlying diabetic state is the best treatment for the complications For prevention of gangrene, cleanliness, proper care of feet and treatment of slightest abrasions is important The shoes should be well fitting and socks soft and warm. Corns and callosities should be treated with greatest care Neuritis should be treated with large doses of vitamin B_1 Pruritus clears up on disappearance of glycosuria but should it persist, treatment is on usual lines In case of failure of vision, a competent ophthalmologist should be consulted.

When surgical interference is required in a diabetic subject the patient should first be stabilized on a suitable diet and insulin In emergencies ketosis must be suitably treated by insulin and oral or parenteral carbohydrates Chloroform should never be given to a known diabetic and ether should also be avoided. Gas and oxygen, avertin or spinal or local anesthesia should be used

Obesity

Obesity is of two types—Exogenous due to some dietetic error or environmental factor such as lack of exercise and endogenous involving abnormality of weight regulating mechanism and synonymous with endocrine obesity In each case income exceeds expenditure and rational treatment is in correcting the balance This is done by (*a*) cutting down the intake and (*b*) by causing the body to metabolize more rapidly.

Diet—A diet should be prescribed which contains approximately 1,000 calories a day. This can be made up as follows

Carbohydrates	..	100 G. or 410 calories
Proteins	...	60 G. or 240 ,,
Fats	..	40 G. or 360 ,,

Fluids and salt should be restricted The following is a sample diet

Breakfast—

Tea with milk and saccharine (no sugar)
One thin slice of bread
Butter ½ ounce
Orange—one

Lunch—

Clear soup
Chapati 1½ ounce cooked weight
Dal 1 oz dry weight
or
Meat and fish 2 oz. uncooked weight
Butter for cooking ½ oz.
Boiled vegetales 5 per cent—liberal helping
Apple or pear—one.

Tea—

Tea with saccharine (no sugar)

Dinner—

Chapati—1½ oz
Meat or fish 2 oz } uncooked weight
or
Dal 1 oz. }
Butter for cooking ½ oz
Boiled vegetables 5 per cent—liberal helping

The following foods must not be taken—sweets, sugar, honey, jams, pastries, cakes, rice, potatoes, nuts, dates, raisins, sherbets, aerated water, etc.

Drugs—Thyroid is of definite value in those suffering from sub-thyroidism. The average dose is ½ grain three times a day. Careful watch should be kept for tachycardia and other symptoms when thyroid is being exhibited.

Amphetamine has been given during recent years and it acts by taking away the appetite. It has, however, been found to cause insomnia and other unpleasant symptoms. The dose is 6 mg. before breakfast and lunch. It should not be given in the evening Recently ł-amphetamine has been introduced and it does not suffer from the unpleasant effects of amphetamine

Diuretics may also prove of value The author has been using injections of esidrone (Ciba) 2 c.c. twice weekly in his otherwise healthy obese patients with benefit Pot cit or acetas in mixture may also be used t i d

CHAPTER XI

AVITAMINOSES

VITAMIN A DEFICIENCY

The functions of vitamin A are *(a)* to promote the nutrition of epithelial surfaces particularly of the cornea, skin and urinary tract, *(b)* the regeneration of the visual purple and (c) possibly also to maintain the healthy function of the nerve cells Recent work has shown that one of the early manifestations of vitamin A hypovitaminosis is defective vision in dim light (nyctalopia). Stewart suggests that adequate supply of vitamin C is also important in prevention of night blindness.

Vitamin A requirement is increased during childhood, pregnancy and infection

Vitamin A is soluble in fat and is present in large quantities in cod liver oil, fresh butter, cream, eggs, liver, carrots and tomatoes.

As concentrates it may be prescribed in the form of avoleum (B D. H) prepalin (Glaxo) or alphalin (Lilly) Combined with vitamin D it can be given as adexolin (Glaxo), haliverol (P D. & Co) or radiostoleum (B D H).

VITAMIN B_1 (THIAMIN) DEFICIENCY

Beri-Beri

Beri-Beri may be primary and due to dietetic deficiency or secondary and due to alcoholic poisoning, gastric carcinoma, chronic intestinal obstruction, cirrhosis of the liver, ulcerative colitis, etc

Primary type may be dry or polyneuritic , or wet or cardiac

Early manifestations of athiaminosis consist of changes in attitude and behaviour suggesting neuresthenia Such symptoms include mental depression, irritability, apprehension, inefficiency in daily tasks, uncertain memory, poor mental concentration and clumsiness. Other complaints are headache, backache, dysmenorrhea, sleeplessness, paresthesiae, anorexia, constipation, epigastric distress after meals and susceptibility to fatigue Low blood pressure, bradycardia when at rest, tachycardia after mild exertion, sinus arrythmia, precordial distress and diminished T. waves of the electrocardiogram also may appear in early cases.

Treatment—The patient should be confined to bed White rice should be prohibited Wheat, peas, beans, oat meal, yeast, *marmite*, proteins, eggs and milk should be given in liberal amounts

Vitamin B_1 (thiamin) should be given both by mouth and parenterally. Suitable preparations for use are Betalin-S (Lilly). Berin and Benerva. The daily dose should be large—25 to 50 mg daily.

Thiamin deficiency is usually accompanied by lack of other vitamins which are needed to produce complete recovery and to prevent relapse Use of liver extract and yeast containing the total vitamin B complex has been effective A very useful preparation in the writer's hands has been B complex prepared by Unichem laboratories.

For atrophy of muscles, faradism and massage are recommended after hyperesthesia has abated Cardiac cases should receive adequate treatment for heart failure, *viz*, digoxin, oxygen, restriction of fluids and salt.

OTHER RESULTS OF VITAMIN B_1 DEFICIENCY

Deficiency of vitamin B_1 is also found associated with subacute combined degeneration of the cord and large amounts given parenterally are valuable in therapy. Significant deficiencies have been found in patients suffering from neuritis of uncertain origin, disseminate sclerosis, cerebro-spinal syphilis, and neuresthenia, and improvement is stated to have followed after treatment with vitamin B_1 M'Collum is of opinion that there are hundreds of thousands of border line cases of functional nervous maladies that occur because of a deficiency of vitamin B_1 in the diet

The normal requirement of vitamin B_1 is said to be 1 to 2 mg of thiamin daily, in pregnancy it is 5 mg.; during fever, gastro-enterities and hyperthroidism 5 to 10 mg. daily.

NICOTINIC ACID DEFICIENCY

Pellagra.

Pellagra is associated with a diet poor in nicotinic acid and proteins of high biological value The typical disease is characterized by glossitis and gastro-intestinal symptoms, dermatitis and pigmentation and nervous and mental symptoms Forms fruste or sub-clinical varieties are, however, very common

Treatment—Specific treatment consists in the administration of nicotinic acid or preferably nicotinamide as nicotinic acid gives rise to several unpleasant symptoms cutaneous flushing, gastric distress, sensation of warmth, tingling, itching, and burning of the skin, dizziness, faintness, increased gastro-intestinal mobility and sebaceous gland activity. Headache is sometimes encountered following administration of the latter drug The dose is 50 mg every 4 hours. In encephalopathy due to nicotinic acid deficiency, the daily dose is very large, 1 to 2 G Suitable preparations of nicotinamide are put on the market by Lilly, B D H, Glaxo and other firms Nicotinamide is available in the form of tablets or elixir for oral administration and ampoules for parenteral use.

The diet should be well balanced and rich in proteins. The caloric intake should be as high as possible. Butter milk (matha), liver, meat, meat broths and vegetable soups, should be given in liberal amounts.

If angular stomatitis is present riboflavin should be given in addition. Ampoules Riboflavin and Nicotinamide (Lilly) contain both in combination

Iron and liver are given if anemia is present An extremely useful preparation is uni-B complex (Unichem Laboratories) If diarrhea is present dilute hydrochloric acid in dram doses should be given thrice daily in a glass of orange juice with meals. Recently B_6 (Pyridoxine) has been used in doses of 300 to 500 mg daily and has proved highly effective in clearing up certain residual symptoms which failed to be influenced by nicotinamide and riboflavin.

Vitamin B_8 (Adenylic acid) is also said to increase the effect of nicotinic acid in pellagra Clinical studies are now in progress

VITAMIN B_2 (RIBOFLAVIN) DEFICIENCY

Ariboflavinosis is possibly the most prevalent, apparently uncomplicated avitaminosis and is somewhat more readily recognised than others Early lesions of the lips, known as cheilitis, begin with pallor of the mucosa at the angles of the mouth without involvement of the buccal mucosa Maceration soon follows, and within a few days superficial transverse fissures appear which extend downward with very little inflammatory reaction The lesions are moist, with honey coloured crusts which can be scraped off without bleeding The lips become abnormally red along the line of closure In addition to cheilitis, fine, scaly, slightly greasy desquamation on a mildly erythematous base usually develops involving the naso-labial folds, the alae nasi, the vestibule of the nose and the ears

Itching, burning, photophobia and excessive dryness of the eyes with granulation and inflammation of the conjunctiva are rather common. Vascularization of the cornea may be seen by examination with a slit lamp Severe cases later may develop interstitial opacities and corneal ulcers.

The tongue is usually smooth with some papillary atrophy and, in contrast to the fiery red colour seen in pellagra, has a purplish red or magenta hue when viewed with natural light

The daily dose of riboflavin is from 5-50 mg when deficiency is present. It is put up in tablets and ampoules Tablets containing 5 mg each are marketed by E Lilly & Co.

VITAMIN B_6 (PYRIDOXINE HYDROCHLORIDE) DEFICIENCY

The exact role played by vitamin B_6 in human nutrition is not well defined The vitamin apparently is associated with the utilization of unsaturated fatty acids and the synthesis of fat from protein Probably its principal function is to act as part of some enzyme system in association with other members of the vitamin B group. Its administration to pellagrins previously treated with nicotinic acid, riboflavin and thiamin has resulted in additional improvement. The nausea and vomiting of pregnancy has been relieved following parenteral and oral therapy. Use of pyridoxine hydrochloride in certain other conditions may be indicated from an investigational standpoint, since clinical reports are conflicting.

Reported clinical uses include :

1. Residual symptoms in properly treated cases of beri-beri, pellagra and riboflavin deficiency.

ii. Nausea and vomiting of pregnancy.

iii. Pernicious anemia patients in relapse.

iv. Parkinson's disease, amyotrophic lateral sclerosis, myasthenia gravis, Sydenham's chorea.

v. Acne

vi Seborrheic dermatitis.

vii Muscular weakness accompanying neuresthenia, hyper-thyroidism and ulcerative colitis.

viii. Radiation sickness.

It is marketed as Hexabetalin by Lilly both as tablets containing 25 mg. each and as ampoules The daily dose during a deficiency state is 20 to 250 mg

CALCIUM PANTOTHENATE DEFICIENCY

The role played by pantothenic acid in human nutrition is not well understood Recent observations indicate that this substance is an essential factor in human nutrition, probably being associated in function with riboflavin A decrease in the blood pantothenic acid level from 23 to 50 per cent has been noted in individuals with pellagra, beri-beri, and riboflavin deficiency when compared with the values of normal persons. In animals lack of this substance is followed by the development of gray hair which returns to normal color after administration of calcium pantothenate

PARA-AMINO BENZOIC ACID

Recent work indicates that this substance may have a suppressive effect upon the growth of rickettsiae in the body. Favourable reports of its use in the treatment of louse-borne typhus and rocky mountains spotted fever have appeared

It also has been demonstrated that this member of B Complex is essential for the growth of most bacteria. The sulfonamides, which are chemically related to para-aminobenzoic acid, inhibit the growth of bacteria because of the antagonism between these substances.

BIOTIN

Rats kept on a diet containing uncooked egg-white develop a deficiency syndrome which can be corrected by the administration of biotin. Apparently a protein in the egg-white combines with biotin, normally present in the diet and inactivates it In human volunteers biotin deficiency has been observed After several weeks on a deficient diet a grayish pallor of the skin developed, together with anemia and an increase in the serum cholestrol All symptoms and signs of the deficiency disappeared in one week after the administration of biotin concentrates.

ADENYLIC ACID

This is another of the B vitamins which can be derived from yeast. A condition often seen in pellagrins, ulcerations of the mucous membranes which

are not healed by the administration of niacin, responds readily to the administration of adenylic acid The pure salt, however, may cause toxic symptoms in man

Choline

It seems to have a definite effect in interfering with the deposit of fat in the liver and for this reason it has been advocated together with inositol in the treatment of liver disease.

Folic Acid

It is a part of the B-complex and a most spectacular recent addition to he family of vitamins. It is of value in the treatment of pernicious and other macrocytic anemias, tropical and non-tropical sprue and celiac disease The al dose is 10 to 20 mg daily. Folic acid is not to be recommended in pernicious emia as it precipitates neurologic symptoms

Vitamin B_{12}

Rickets et al (1918) isolated a crystalline compound from liver known now as vitamin B_{12}. A ton of fresh liver yields only 250 mg of this reddish crystalline material It is thermostable and contains 4 per cent of cobalt in addition to phosphorus and nitrogen Recently it has been produced much more economically from the culture medium on which streptomyces griseus has been grown Vitamin B_{12} not only corrects the blood dyscrasia, but also alleviates the neurologic signs and glossitis of pernicious anemia.

Castle suggests that vitamin B_{12}, the extrinsic factor and the anti pernicious anemia factor are identical and that the role of the intrinsic factor in the gastric juice is to promote the absorption of the extrinsic factor

Vitamin B_{12} is also used in macrocytic anemias of infants, pregnancy, certain cases of sprue and tropical macrocytic anemias in relatively larger doses It has been found to give striking improvement in patients suffering from diabetic neuropathy, osteoarthritis, and osteoporosis and in children with retarded growth

The dose of vitamin B_{12} is 15 to 25 mg once or twice a week until remission occurs and thereafter 15 mg fortnightly If neurological symptoms are present the dose is 10 mg daily or on alternate days for 3-6 months and thereafter 10-20 mg weekly. In osteoarthritis the dose is 30-900 mg weekly for several weeks

VITAMIN C DEFICIENCY

Scurvy

The average adult in normal health requires 30 to 100 mg of ascorbic acid daily. If the diet contains enough raw vegetables and fruits, this requirement is met. When there are excessive demands, such as occur in pregnancy, lactation, infection or hyperthyroidism, the daily requirements may be doubled or trippled and unless there is a corresponding increase in intake, serious deficiencies are apt to result. Symptoms and signs of clinical and sub-clinical forms of scurvy are fairly well-known.

Treatment—This consists in giving orange juice or tomato juice Preparations of ascorbic acid such as cevalin (Lilly), celin (Glaxo), redoxan or cantan are preferable to orange juice or tomato juice when the disease is established Both may be used together. Three to five tablets of 50 mg each

should be given daily. In severe cases where intestinal absorption is imperfect, intramuscular or intravenous injections may be given Ampoules containing 100 to 500 mg are on the market

Painful limbs should be wrapped in cotton wool Anemia improves with ascorbic acid but iron may have to be given.

For the mouth condition, hydrogen peroxide gargles are recommended

Vitamin D Deficiency

The part played by vitamin D in the prevention and treatment of rickets is well known Aspects of vitamin D deficiency concerned with osteomalacia, the increased demands for vitamin D occasioned by pregnancy, deficiencies resulting from disturbances of fat metabolism, and the relationship of vitamin D to the disturbance of calcium-phosphorus metabolism in hypoparathyroidism are, however, not so well known.

A large number of chemically related sterols having anti-rachitic activity have been described The most important are calciferol or D_2 which is produced by ultra-violet irradiation of a plant sterol (ergosterol); 7-dehydrocholestrol or D_3 which is of animal origin and responsible for most of the vitamin D activity of cod liver oil and irradiated milk; and dehydrotachysterol Calciferol has recently been used with success in the treatment of lupus vulgaris and dehydrotachysterol in the treatment of hypo-parathyroid tetany and scleroderma.

Rickets

Rickets is particularly prone to develop in vitamin D deficient individuals during periods of rapid growth and therefore is more frequently found in infants and children Premature infants are particularly susceptible.

Craniotabes, delayed closure of the fontanelles, bossing of the skull, head rolling, irritability, head sweats, costo-chondral and epiphyseal enlargement, delayed dentition, prominent abdomen, muscular weakness and delayed sitting and walking are usually noted Advanced cases with more marked bony deformities are readily recognized

Prophylaxis and Treatment—Prevention of rickets by early administration of vitamin D is the method of choice The action of vitamin D is to promote retention of calcium and phosphorus The diet should be rich in milk, milk products and a preparation with high content of vitamin D should be administered It may be necessary to supply iron to remedy an attendant anemia or vitamin C for associated scurvy. A standard preparation of cod liver oil, ostelin (Glaxo), radiostol (B. D. H.), deltalin (Lilly), or massive-D (Unichem) may be given and are suitable Preparations containing both calcium and vitamin D are calsimil (B. D H.), and ostocalcium (Glaxo). When an injectable preparation is required calcium with ostelin (Glaxo) is useful

When vitamin D is not absorbed due to any reason, the infant may be exposed to ultra-violet rays As little strain as possible should be put on the skeletal system when the bones are still soft. Curved bones tend to straighten during the year that follows healing Orthopedic measures should, therefore, be delayed and nature given a chance to remedy the deformity.

Late Rickets

So called late rickets, osteomalacia, and hunger or war osteopathy, though differing somewhat in their clinical manifestations, have the same basic rachitic process as that in the young

Food rich in calcium such as milk and eggs should be given and vitamin D supplied in adequate doses

One or more courses of ultra-violet rays of 2 or 3 months duration may be ordered.

Celiac disease may also be accompanied by rickets The treatment consists in exposure to ultra-violet rays as fats are badly tolerated

In renal rickets the prognosis is hopeless. Bony improvement has been reported under treatment by large doses of vitamin A and D Alkalies (100 grains daily), calcium gluconate 90 grains daily and vitamin D 20,000 international units daily may be given a trial.

Tetany

Tetany may be hypocalcemic as in rickets, celiac disease, hypoparathyroidism and renal disfunction or eucalcemic as in gastric disorder, bicarbonate or alkali administration and hyperventilation In the former group there is a fall in total calcium, in the latter group in ionized calcium The level of serum calcium can be raised by intravenous administration of calcium, by administration of vitamin D with a diet rich in lime, by injection of paratharmone or by administration of an acid producing salt like ammonium chloride

In rachitic tetany 10 c c of a 10 per cent solution of calcium gluconate is given intravenously and vitamin D administered in large doses One single massive dose of 600,000 I U is efficacious When convulsions occur in rapid succession sedatives like phenobarbitone or bromides are necessary temporarily.

Tetany of renal disease is best treated by administration of alkalies combined with parenteral administration of calcium gluconate

Tetany due to vomiting is treated by administration of large amounts of normal saline parenterally or rectally Rarely calcium gluconate or ammonium chloride may be needed

Tetany which arises due to exhibition of alkalies in the treatment of peptic ulcer or pyelitis is relieved on cessation of alkalies

The treatment of parathyroid tetany is described under diseases of the parathyroid gland.

Lupus Vulgaris

The successful treatment of lupus vulgaris by Calciferol (Ostelin) has been described in the Chapter on Recent Progress

OTHER USES OF VITAMIN D

Among other uses of vitamin D, the following have been listed: arthritis, psoriasis, allergic disorders, acne, fractures, tooth formation and maintenance of tooth structure, pregnancy and lactation, tuberculosis, pemphigus, and parathyroid tetany.

Vitamin D in massive doses should not be given to old people with evidence of arteriosclerosis particularly of the aorta, or to individuals who have renal stones. It should be used with caution in any patient with kidney disease, a sensitive colon, or disproportionate available supplies of calcium and phosphorus

Vitamin D Toxicity—Vitamin D in large doses may give rise to toxic symptoms Early symptoms of hypervitaminosis D consist of anorexia, nausea, vomiting, abdominal cramps, frequent stools, pallor, lassitude, and frequent urination Less common but more significant symptoms are vertigo, muscular weakness, paresthesia, headache, joint and muscle pain, tenderness of the teeth and gums, neuralgia of the mandibular branch of the trigeminal nerve, and impaired memory. Serum calcium may increase sufficiently to produce symptoms and signs of hypercalcemia

Treatment consists in immediate withdrawal of vitamin D.

VITAMIN E DEFICIENCY

The vitamin E requirement of man has not been definitely determined and available data does not establish the unquestionable value of vitamin E in reproductive disorders of the male or female. Clinical studies with the use of vitamin E active substances in the treatment of sterility and habitual abortion indicate their possible prophylactic and therapeutic value.

Vitamin E may be of some benefit in treating certain neuromuscular disorders, such as amyotrophic lateral sclerosis, progressive muscular dystrophy and atrophy. pseudohypertrophic muscular dystrophy, certain myatonias, disseminate sclerosis, atrophic arthritis, and primary fibrositis Alpha-tocopherol has been effective in relieving neuromuscular symptoms, roaring sensations in the ear, anorexia and insomnia in patients with malnutrition but without clinical evidence of pellagra, beri-beri or riboflavin deficiency. The E-active substances have been used with some success in treating the paralysis of anterior poliomyelitis and to promote healing of interstitial keratitis. Vitamin E is known to potentiate the action of vitamin A. It is marketed as ephynol (Roche), phytogerol (B D. H.), viteolin (Glaxo) and eprolin—S (Lilly) One capsule of any of the preparations may be given t i d.

Recently vitamin E has been used in the treatment of patients with stormy menopause with great success 10 to 20 mg. daily are required for 2 to 6 weeks.

VITAMIN K DEFICIENCY

Vitamin K deficiency causes hypopro-thrombinemia which is characterized by oozing hemorrhages and by prolonged bleeding and clotting times. Reduction in prothrombin is found during periods of inadequate supply of this vitamin

as well as in conditions producing poor intestinal absorption, altered fat digestion, or impairment of liver function.

New born infants normally experience decreases in prothrombin during the first few days of life which may be severe enough to cause hemorrhagic manifestations, depending upon maternal supplies of vitamin K available prenatally. Excessive bleeding is common in obstructive jaundice and other conditions which reduce the amount of bile in the intestinal tract Bleeding also may occur in diseases affecting the liver, such as hepatitis and cirrhosis

Vitamin K may be prescribed as menadione (Lilly) or Kapilon (Glaxo) The dosage in hemorrhagic disease of the new-born is prophylactic 0 5 to 2 mg. in a single dose and curative 0 5 to 2 mg twice daily

Recently it has been used with success in refractory cases of urticaria. The dose varies from 2 to 8 mg daily in individual cases and the treatment may need to be continued for 1 to 4 weeks

pituitary replacement therapy has been tried but the results are uncertain. Recently methyl testosterone sublingually has been used with some encouraging results.

DIABETES INSIPIDUS

The disease is characterized by marked polyuria and thirst.

Treatment—If syphilis stands in causal relationship appropriate anti-syphilitic treatment is required. If a tumour is discovered deep X-ray therapy should be tried, tumour in this region not being amenable to operative interference

Symptomatic treatment consists of measures to relieve thirst and polyuria Solutions of the posterior lobe (Pituitrin) may be injected subcutaneously or sprayed into the nose in doses of 1 c.c. twice daily. As the effect of aqueous solutions is short lived it is of advantage to use an oily solution Pitressin tannate 0 5 c c given intramuscularly may prove effective for as long as 48 hours In America posterior lobe powder (40 to 50 mg daily) is snuffed into the nose and the results are satisfactory.

FROHLICH'S SYNDROME

(Adiposo—genital syndrome)

The disease is characterized by poor sexual development, adiposity, an increased sugar tolerance and a lowered B M. R. The fat is deposited more or less generally, but particularly round the bust and hips

Treatment—A reducing diet should be prescribed to control the obesity. Gonadotrophic hormones have been used to hasten sexual development but are still in the experimental stage.

If there is evidence of a brain tumour X-ray irradiation or surgical interference should be considered.

DERCUM'S DISEASE

Dercum's disease is believed to be deficiency of the pars nervosa of posterior lobe in adults The disease is rare and occurs more commonly in females. It is characterized by general deposition of fat but local deposits also occur These fatty tumours are sometimes painful

Asthenia is a troublesome symptom and the presence of creatinuria suggests abnormal metabolism.

Treatment—A low caloric reducing diet should be prescribed. Prostigmine affords great relief.

DISEASES OF THYROID GLAND

Adolescent Goitre

A swelling of the neck at puberty is the only symptom It occurs more frequently in girls than boys

Treatment—Treatment consists of hygienic measures, elimination of septic foci and the administration of a harmless iodine preparation such as syrup ferri iodide, 1 dram three times a day.

The use of thyroid extract and Lugol's iodine has been followed by thyrotoxicosis and is not recommended.

Endemic Goitre

(Adenoparenchymatous Goitre)

Endemic goitre occurs in great water sheds of the Himalayas, Alps, Pyrenees, the Andes and the rocky mountains Statistical evidence shows that its incidence is inversely proportional to the iodine content of the surface water

Prevention—Prevention is accomplished by use of either (*a*) iodized table salt or (*b*) potassium iodide 3 grains daily for 10 days both during autumn and spring

Treatment—The use of potassium iodide or Lugol's solution is not recommended as on the continent at least it is said to provoke iodine-basedow, and in any case is not effective.

Surgical removal is not indicated in mild cases occurring in young subjects It should be reserved for aesthetic effect, when pressure symptoms arise, if the gland becomes nodular or shows malignant change and if hypertnyroid symptoms develop

Primary Thyrotoxicosis

(Exophthalmic Goitre—Grave's or Basedow's Disease)

The disease commonly occurs in the third or fourth decades but may occur earlier or later Females are affected six times more often than males. The onset often dates from a crisis in the life of the patient, a mental shock, an undesired pregnancy or some intercurrent illness The disease is characterized by tachycardia, tremor, insomnia, loss of weight and diarrhea; exophthalmos or the goitre may not be present, but seldom are both absent

Treatment—Concepts of therapy in hyperthyroidism are constantly being revised because of the discovery that over-activity of thyroid secretion can be controlled by the oral administration of thiouracil and of the more

recently described propylthiouracil Although a few years ago nearly all frank cases of hyperthyroidism came to surgery sooner or later, it is now possible to treat the majority by medical measures alone, with expectation that the disorder can be kept under control by continuous or intermittent treatment. In some instances prolonged remissions may be induced and in some these may be permanent.

Thiouracil and Propylthiouracil—In 1943 Astwood reported on the effects of thiourea and thiouracil in human beings some of whom had hyperthyroidism. After a latent period signs of hyperthyroidism gradually subsided only to return with cessation of treatment. Since then many hundreds of patients with Grave's diseases and toxic thyroid adenomas have been given thiouracil (which soon demonstrated its superiority over thiourea) A lowering of the basal metabolic rate to normal zone or below was noted in nearly all cases. In some clinics this drug was used as a means of preparing patients for partial thyroidectomy whereas in others it has been used as the chief therapeutic weapon in combating hyperthyroidism In some instances, after several months of therapy, remissions apparently have been induced permitting all treatment to be discontinued Whether this constitutes a permanent cure can be determined only with the passage of time A moderate number of serious toxic reactions caused by the drug were reported and caused a search for less toxic compounds Astwood and Vanderlaan recently showed that propylthiouracil possesses anti-thyroid properties similar to those of thiouracil and in 100 treated cases no serious toxic manifestations were encountered.

Method of Action—Just how the thiourea compounds depress the functions of the thyroid is not known Shortly after first administration of the drug to rats, the iodine content of the thyroid drops sharply and the formation of new thyroid hormone ceases Since a considerable quantity of the hormone is stored in the normal thyroid hormone, there is a delay of several days or weeks before the depressing effects are clinically recognizable An increased amount of hormone is stored in glands of hyperthyroid patients previously treated with iodine and in those with toxic nodular goiters; therefore, in these the latent period is longer than it is in patients with untreated Grave's disease. It has been found that, by varying the dosage of the drug, any desired degree of suppression of thyroid function can be established and maintained

Toxic Effects—Major toxic reactions which may necessitate withdrawal of the drug develop in approximately 10 per cent of the patients treated with thiouracil These are agranulocytosis and drug fever The first of these is the most to be feared, inasmuch as a few deaths attributable to it have been reported Thiouracil agranulocytosis need not be fatal however, if it is detected in the early stages, the drug discontinued and combative measures undertaken vigorously. This complication is less frequent as the period of treatment is prolonged. Benign leukopenia without agranulocytosis commonly is seen earlier in the course of treatment, it comes on gradually without symptoms and regresses whether or not the drug is withdrawn. In agranulocytosis the granulocyte count drops rapidly and there are attendant constitutional symptoms—fever, pharyngitis, and grippe-like symptoms.

Drug fever is fairly common and may be attended by a skin rash In itself this toxic reaction is not serious, but when it occurs it may be impossible to continue treatment with thiouracil

Minor toxic effects attributed to thiouracil include transient leukopenia, diarrhea, jaundice, edema with elevation of the serum chloride concentration, transient swelling of the submaxillary glands lymphadenopathy and gastrointestinal disturbances When excessive doses of antithyroid drug are given over a prolonged period, considerable enlargement of the thyroid gland may be noted The development of this sign would be an indication to reduce the dosage

Propylthiouracil has a distinct advantage over the thiouracil in that agranulocytosis and drug fever have not been noted during its administration

Dosage—Thiouracil is given initially in doses of 0 1 Gm. three to six times daily for a period varying from two to four weeks, depending on the response As the basal metabolism falls and the signs of hyperthyroidism subside, the dose is reduced to 0 2 Gm. daily and continued for several months unless toxic symptoms or signs of myxedema develope, in which case the drug is discontinued or dosage further reduced

When propylthiouracil becomes more generally available it undoubtedly will replace thiouracil as the drug of choice, because of its minimal toxicity. The initial dose of propylthiouracil is 50 mg every eight or twelve hours, the slightly larger dose of propylthiouracil being necessary in severe cases and in those in which iodine has previously been given Symptomatic improvement may begin within a few days but in some individuals several months may elapse before there is complete recovery of normal health As the signs of hyperthyroidism disappear the daily dose of propylthiouracil is reduced to 75 mg and later to 50 mg This maintenance dose is continued for at least six months, when all treatment is discontinued and the patient is observed for signs of relapse. Most patients remain well, if relapse should recur the maintenance dose is given again for several months In all likelihood remission will be induced

With this type of therapy surgical extirpation of the thyroid is unnecessary in all save a very few in whom a goiter persists and presents an objectionable appearance

Iodine should not be used in conjunction with thiouracil or propylthiouracil as it may delay considerably the response to the specific compounds

The question of what to do about the exophthalmos often associated with hyperthyroidism and which may persist after the hyperthyroid state has been controlled is still arousing considerable disagreement Mears and his group believe that progressive exophthalmos is due to the over activity of the thyrotropic hormone and that it is best controlled by the administration of thyroid extract This explanation is not satisfactory in many cases and other authorities believe that the best means of controlling this distressing complication is elimination of the disease with which it is associated, namely hyper thyroidism Rare cases require operation of the eye sockets

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Surgical Treatment—When for one reason or another use of the antithyroid compounds is impractical or unsuccessful in the control of hyperthyroidisim, thyroidectomy must be considered. This is purely a surgical problem, and the decision of when to operate must be left entirely in the hands of a competent thyroid surgeon. Preoperative preparation of the patient is best done by close cooperation between surgeon and internist In the very best thyroid surgical clinics operative mortality is very low (1 per cent) and complications from surgery are minimal. Complete remission in the hyperthyroid state is accomplished in approximately 75 to 80 per cent of the cases. Secondary operations, medical treatment or X-ray therapy will prove necessary in the remainder. In surgical clinics less competent than the very best, the incidence of mortality and of surgical complications are higher, and the percentage of recovery is lower

X-ray Therapy—It has long been known that mild thyrotoxicosis may respond to X-ray treatment The selection of cases is difficult, remissions may be short lived, and the effect of this type of therapy on other treatment is not clearly understood Certainly the number of cases in which radiation is indicated is very small, and these patients must continue to remain under medical observation

Radio-active Iodine—Since nearly all the Iodine taken into the body is trapped by the thyroid, the idea of utilizing radio-active iodine as a means of inducing "Internal radiation" has developed Results of this type of treatment in small series have been reported and these seem to be favourable Perfection of the method and further clinical trial are necessary before the true value of radio-active iodine in the treatment of Grave's disease will be known.

ADENOMA

Adenoma may be solitary or two or three may be present When there are numerous rounded scattered nodules, the condition is pseudo-adenoma or adeno-parenchymatous goitre The common symptoms are deformity, dyspnea due to pressure on the trachea, thyrotoxicosis or alterations in voice

Treatment—Treatment is surgical in all cases and for the following reasons: there is possibility of malignant change; thyrotoxic symptoms develop in about 25 per cent round about the age of 40 years, there is the danger of suffocation, and for cosmetic effect

INTRATHORACIC GOITRE

Intrathoracic goitres may be complete or incomplete. Complete intrathoracic goitres occur most frequently on the left side. This variety is easily missed and the symptoms to which it gives rise are easily mistaken for heart disease, asthma, etc

Treatment is surgical If symptoms of thyrotoxicosis are present premedical care (rest, sedatives, thiouracil) is important before operative measures are adopted.

THYROIDITIS

Acute—The condition may be primary or follow on a known infection such as tonsillitis or pneumonia. The characteristic features are painful swelling of the thyroid, fever and dysphagia.

Treatment—Rest in bed, plenty of fluids, sedatives and analgesics are indicated If pus is present surgical intervention is called for Careful watch must be kept for signs of tracheal compression as urgent surgery is indicated

Chronic—Chronic thyroiditis occurs in two forms, a fibrous type (Riedl's struma) and a lymphoid type (Struma lymphamatosa or Hashimoto's disease) Decourcy believes that Riedl's struma commences with a perithyroiditis which produces constriction of blood vessels, and that the resulting ischemia causes formation of the ligneous tissue characteristic of the condition Treatment is subtotal thyroidectomy.

In Hashimoto's disease X-ray therapy may suffice as the lymphoid tissue is radio-sensitive If operation is performed subsequent hypothyroidism may result, it should be corrected by thyroid administration

CRETINISM

Desiccated thyroid is the treatment of choice In a true cretin this will be required for life. The dose for an infant is 1 10 gram daily for older children 1 to 2 grains daily are required

MYXEDEMA

Desiccated thyroid will ameliorate all symptoms The dose is determined by trial and error. The minimum effective dose that will cause a return of the metabolism to normal should be used Frequent B M R determinations during the period of thyroid therapy are advised so that hyperthyroidism is not introduced In adults the daily dose required is seldom more than 1 2 to 3 grains given usually in divided doses It is best to start with 1 10 to 1 2 gram and gradually increase this if necessary

Response to thyroid treatment is most dramatic There is often an immediate diuresis and loss of weight, a sense of well being, improvement in mental outlook, sleepiness and fatigue are overcome; constipation improves; the cardiac symptoms if present gradually disappear The treatment is purely substitution therapy and the patient with hypothyroidism and myxedema will probably require it for life

10 per cent dextrose in normal saline should be started at once. The infusion is continued until the patient feels distinctly better. A subcutaneous injection of 50 to 75 c.c. of the cortical hormone or 10 to 25 mg of Doca (percorten ciba) is also made at the outset. Additional small amounts of hormone (20 c.c. cortin) and glucose saline should be given 6 hourly. Fluids and salt by mouth should be substituted as soon as the patient is sufficiently recovered to take them. Maintenance doses of the hormone should be continued after a remission has occurred.

ADRENOGENITAL SYNDROME

Adrenogenital syndrome is caused by a tumour of the adrenal cortex or an arrhenoblastoma of the ovary. The disease gives rise to a reversal of the sex characters. In men there is femininity and impotence. In women the disease gives rise to virilism. There is excessive growth of hair on the face, the menses cease, the clitoris enlarges, the breasts atrophy and the voice becomes manly. The urine shows increase of androgenic sterols. A close resemblance often exists between this condition and Cushing's syndrome (pituitary basophilia). The distinction is made by the presence in the pituitary condition of a lax musculature giving the appearance of obesity, a transparency of the skin, decalcification of bone and glysosuria. In Cushing's syndrome the steroids in the urine are of a different kind and much less in quantity.

Treatment of adrenogenital syndrome is surgical removal of the adenoma.

Tumours of the adrenal cortex may also occur in young children and little girls are the usual victims. Puberty is precocious and little girls of 4 or 5 present a full growth of pubic hair and well developed breasts. In boys there is an early growth of hair on the face and pubes. Cases of successful removal of the tumour are reported but unfortunately the disease frequently occurs or gives rise to secondaries.

PHEOCHROMOCYTOMA OF ADRENAL GLAND

(Paraganglioma)

It is a medullary tumour of the chromaffin cells and is usually benign. It may arise not only in the medulla of the adrenal gland but also wherever Chromaffin tissue is present (carotid body, retroperitoneal tissues, along the abdominal aorta, organ of Zukerkandl and sacrococcygeal region).

The symptom complex to which it gives rise depends upon discharge of epinephrin or a similar substance into the circulation. During the attacks the patient begins to complain of a marked pounding headache, nausea, dyspnea, orthopnea, palpitation, blanching of the peripheral portions of the body, paresthesiae, abdominal cramps, vomiting and marked weakness. Attacks last from minutes to hours. Death may occur during an attack from shock, pulmonary edema, left heart failure, coronary occlusion or cerebral accidents. Attacks may occur spontaneously or may be induced by emotional upset, fear, trauma, exertion, lying on the side of the tumour and abdominal massage. Systolic blood pressure may rise to 300 mm or more and the diastolic to 100 mm. or more. Between attacks blood pressure may be normal or slightly elevated.

Treatment—Attacks occasionally may be controlled by means of sedatives, ergotamine tartarate or nitroglycerin. Surgical removal is essential for cure Following removal of the tumour blood pressure may fall precipitately Intravenous infusion and epinephrine intravenously, and in oil (subcutaneously) are indicated for immediate collapse Adrenal cortical extract and Dopa are valuable agents following emergency regime Hymen and Menber report four successful removals

MALE SEX HORMONE

The hormone produced in the testes is called testosterone A similar hormone produced synthetically—testosterone propionate—is a very much more effective preparation than the natural hormone. The present knowledge of testosterone propionate is summarized by Gujral (1912) and Aub and Kety (1943). One of the most important developments in recent endocrine investigation is the evidence that testosterone exerts, in addition to its effects on male secondary sex characters, a significant influence on the metabolism of the body as a whole and on the growth of the muscle and bone. Administration of the hormone can raise basal metabolism, lower the respiratory quotient, decrease—as do other steroid-hormones—the excretion of electrolytes and water, and promote retention of phosphorous and nitrogen That the last named effect indicates generalized increase in musculature is strengthened by observations of simultaneous increase in creatine excretion in treated patients or of androgen output in children Physical endurance and capacity for muscular work are markedly heightened in patients with hypogonadism treated with the hormone, but no such effect is produced by its administration to normal men Another interesting property of testosterone is its ability to produce marked increases in red blood cells and hemoglobin in eunuchoid individuals.

Effects on the skin and vascular system are seen in decreased vasomotor instability and increased velocity of blood flow through surface vessels after testosterone administration Good results have been reported in treatment of such vascular conditions as essential hypertension, peripheral vascular disease and angina pectoris Certain dermatitides of old men have yielded well to testosterone when other forms of treatment have failed Some relationship, as yet imperfectly understood seems to exist between the male hormone in relative excess and occurrence of acne vulgaris.

Testosterone propionate may be administered intramuscularly (Perandren Ciba, Neo-hombreol Organon, or Testoviron Schering), orally (tablets methyl testosterone), by inunction (perandren ointment, neohombreol ointment) and by subcutaneous pellet implants When given orally much higher doses are required than when the drug is given parenterally. Dosage and mode of administration will of course vary with individual needs and preferences A standard approach is to start with 25 to 50 mg. weekly until desired effects are seen, then substitute maintenance doses of 10 to 40 mg. methyl testosterone daily by mouth In children doses should be one-half those for adults. In women the dose should not exceed 300 mg. per mouth to avoid masculinizing effects.

Hypogonadism

The condition is characterized by an infantile penis, atrophic testes, poorly developed prostate and seminal vesicles, scanty pubic hair with a female distribution and a local increase of fat at the sites where it normally accumulates in the female such as over the hips, the breasts and the mons veneris.

Treatment—Testosterone propionate 25 mg. should be given intramuscularly twice weekly, for several weeks. The therapy can then be continued by oral use of methyl testosterone 10 to 40 mg daily All of the male secondary sex characters are stimulated, with accompanying increase in virility and improvement in psychologic status.

Cryptorchidism

Five to ten mg of perandren should be given twice weekly Bleriot reports that descent of testes occurred in his cases after 100 to 150 mg had been given Some authors consider that cryptorchidism is treated more successfully by injections of chorionic gonadotrophic hormone A suitable preparation is pregnyl (organon) The total dose should not exceed 6,000 international units.

Male Climacteric

Werner, discussing the male climacteric, states that an endocrine dysfunction plus the imbalance of equilibrium between the two divisions of the autonomic nervous system with the evidence at times of disturbance in the psychic centres is due primarily to the decline of the sex glands Salubrious effect on the mental status is promoted by the administration of the male hormone 10 mg of the hormone should be injected twice or thrice weekly

Impotence

Sexual impotence in the male may be due to one or more of the following causes (1) psychic disturbances, which are commonest and most difficult to treat; (2) organic disease of the nervous system, which is usually overshadowed by other manifestations; (3) local lesions of the genitalia, which are unimportant numerically and easily recognized and (4) disorders originating from disturbances of endocrine glands

Treatment—In my opinion benefit from treatment with testosterone propionate results only in those cases of impotence in which either the function is poorly developed or fails during later life In all these cases the urinary androgen content is low and is raised by injections of testosterone propionate When improvement follows the use of testosterone propionate in cases of psychic impotence, invariably evidence of hypogonadism is also present Favourable results have been reported from using a combination of testosterone and gonadotrophins

Male Infertility

It is generally agreed that gonadotrophic therapy is more suited to this condition than injections of male hormone Rubinstein and Kurland have, however, reported successes following treatment with testosterone The dose recommended is 5 mg three times a week. It is probably wise to begin treatment with testosterone propionate and follow it with a gonadotrophin (antostab boots).

Benign Prostatic Hypertrophy

Treatment with male hormone is of no value Recently castration and the use of follicular ovarian hormone have been recommended

Angina-Like Pain

McGavak reports successful treatment of angina-like pain not responsive to vasodilator drugs and sedatives by the use of testosterone Symptoms of climacterium are usually found associated with the cardiac syndrome The patients may complain of a dull, constant oppression over and to the left of the sternum, a sense of uneasiness in the chest; attacks of angina-like pain not related to effort and unrelieved by nitro-glycerine; breathlessness without effort, long sighing respirations; and palpitation without change in the pulse McGavak cautions against the use of testosterone in organic lesions, as it may not only do no good but do actual damage on account of the stimulating effects of the drug

Enuresis

Successful treatment of enuresis in boys and girls has been recently reported, by intramuscular injections of the male hormone. Treatment should be continued by sublingual methyl testosterone, after the condition has been controlled by parenteral therapy

Gynecologic Disorders

The male hormone in carefully regulated dosages has been found useful in a wide variety of gynecologic conditions These are listed as follows:

1 Mastodynia
2 Post-partum breast engorgement.
3 Inhibition of lactation
4 Functional uterine bleeding
5 Dysmenorrhea.
6 After pains
7. Pelvic inflammatory disease
8. Nocturia.
9. Nymphomania.
10 Precocious sexual maturity

Mastodynia (Chronic Mastitis)

The condition is characterized by pain and by nodular swelling of the breasts. The condition regresses on administration of androgens. Loeser recommends 25 mg twice for several weeks As the treatment may be attended by certain undesirable manifestations such as growth of hair on the upper lip, deepening of the voice and enlargement of the clitoris, great care must be used in its administration. Spence recommends treatment by local inunction, 3 to 10 mg daily being rubbed in

Menorrhagia and Metropathia

Loeser used male hormone successfully in a number of cases of menorrhagia Mukherjee treated 9 cases of metropathia with encouraging results The dose recommended is 25 mg. every day until the bleeding stops 5 mg

should then be given twice weekly for 2 weeks and then once weekly for 4 weeks In severe cases the first two doses may be 50 mg each (*see* also female sex hormone) A careful watch should be kept for appearance of symptoms of masculinization in which case treatment should be stopped

Premenopausal Uterine Bleeding

Testosterone propionate has been used successfully for premenopausal bleeding The advantages claimed for it are

1. It obviates the need of applying radium or the use of X-ray, which is usually followed by severe climacteric symptoms
2. It does not cause sudden and permanent ammenorrhea
3. It does not require hospitalization and is really accepted by patients

A total dose of 50 to 200 mg given over a month was found effective by Mazers

Dysmenorrhea

While the treatment with testicular hormone is effective in essential dysmenorrhea, there is little or no benefit in organic or organically determined dysmenorrhea The dosage recommended is from 250 to 300 mg of testosterone propionate during one cycle. The treatment may be commenced from the seventh to the fifteenth day of the cycle

Inhibition of Lactation.

Smaller doses are required for relief of post-partum breast engorgement than for inhibition of lactation Ten mg subcutaneously daily may be given at the time the lactation starts (*see* also Folliculor hormone)

FEMALE SEX HORMONES

The sequence of events that takes place in a normal estrus cycle is as follows :

1 Due to stimulation by the anterior pituitary, the ovarian follicles mature

2 The mature ovarian follicles liberate estrogen which is responsible for proliferative uterine change

3. Midway in the cycle, one follicle ruptures, releasing the ovum The ruptured follicle is luteinized, giving rise to a corpus luteum

4 The corpus luteum elaborates a specific hormone progesterone—and in addition secretes estrogen

5 Progesterone changes the structure of the endometrium into the secretory or premenstrual phase

6. If fertilization fails to occur, the uterine mucosa breaks down and menstruation occurs

Improper balance of follicular and luteal hormones or lack of stimulation by the anterior pituitary may give rise to disturbances of menstruation Restoration of the balance by replacement of the deficient hormone will often lead to cure

1. Gonadotrophic Hormones

Gonadotrophic hormones are of three kinds·

1 Those prepared from the anterior lobe of the pituitary such as ambinon (Organon) and preloban (Bayer)

2 Chorionic gonadotrophic hormone such as pregnyl (Organon), gonan (B D H), physostab (Boots) or antuitrin—S (P. D. & Co)

3 Equine gonadotrophic hormone such as antostab (Boots), serogan (B D H), or gestyl (Organon).

The chorionic gonadotrophic hormone the luteinizing hormone is present in large quantities in the urine of pregnancy. Its clinical use in the treatment of cryporchidism has already been discussed.

The equine gonadotrophic hormone is found in the blood serum of pregnant mares during the middle third of the pregnancy. Like the true anterior pituitary gonadotrophic hormone it stimulates the growth of the primordial follicles and is a therapeutic agent of great value in the treatment of sterility and menstrual disorders.

2. Ovarian Hormones

Ovarian hormones are two in number : the follicular hormone or estradiol and the luteal hormone or progesterone. Follicular Hormone : the follicular

or estrogenic hormone occurs widely distributed in animal and plant kingdoms In the human female three important estrogenic compounds have been found, estrone, estriol and estradiol Of these the last is the most powerful and used in the form of its ester Suitable proprietary preparations are progynon B oleosum (Schering), ovocyclin—P (Ciba), Oestroform (B D H), dimenforman (Organon) and benzogynestrol (Rousel Labs)

In addition to these natural hormones several substances with estrogenic properties have been synthesized, the principal ones being diethylstilbestrol or stilbestrol and dihydro-stilbestrol or hexestrol Both these substances are very active when administered by mouth Suitable proprietary preparations are clinestrol (B. D H), stilbestrol (Glaxo), and synthovo (Boots) and dinestrol

Physiological action of Follicular Hormone—It produces estrus in immature experimental animal, promotes the growth of reproductive organs in the female, controls the development of secondary sex characters, produces proliferative changes in the uterine endometrium, sensitizes the uterine musculature and stimulates capillary vasodilatation in the uterus It also inhibits the anterior pituitary gonadotrophic hormone when given in sufficient concentration It is also believed to promote development of the duct system of the breasts

Clinical uses of Follicular Hormone—The hormone is useful in the following conditions:

1. Amenorrhoea and other menstrual disturbances
2. Sterility
3. Menopause
4. Leukoplakia vaginalis and pruritus vulvae of hormonol etiology
5. Inhibition of lactation
6. Prostatic cancer
7. Inoperable cases of cancer of the breast

Luteal Hormone—The luteal hormone or progesterone brings about the secretory phase of the endometrium and prepares the endometrium for the implantation of the fertilized ovum in that it desensitizes the uterine muscle and maintains pregnancy in the very early stages It may be administered parenterally and by mouth. When given by mouth the doses required are much higher than when the drug is administered parenterally

Suitable preparations for injections are proluton (Schering), progestin (B. D H) and lutocyclin (Ciba) The hormone is put up in ampoules in oily solution and the dose is from 1 to 5 mg. Preparations that can be given by mouth are lutocyclin oral (Ciba) lutogyl (Roussel), and probiton C (British Schering).

Clinical Uses—The hormone is of value in habitual abortion and as complimentary to ovarian hormone in the treatment of amenorrhea Its use has been recommended in hyperemesis gravidarum

CHAPTER XIII

COMMON DISEASES OF WOMEN

AMENORRHEA

Amenorrhea is primary when it is due to failure or onset of menstruation at puberty and secondary when it occurs in women who have previously menstruated

Primary Amenorrhea—Primary is due to:

(a) general ill health from malnutrition, anemia, tuberculosis or other long standing illness

(b) developmental abnormalities such as a rudimentary uterus

(c) endocrine disorders such as hypo- or hyper-thyroidism, pituitary dysfunction, adreno-genital syndrome and ovarian disorders

Treatment—Treatment is unsatisfactory. When a cause can be discovered treatment should be directed towards its removal. Malnutrition should be corrected, anemia treated by iron and liver, and tuberculosis or other disease treated appropriately

When no cause can be discovered the patient is at first given six injections of anterior pituitary gonadotrophin (ambinon or proloban 100 rat units) twice weekly After this, courses of follicular hormone and corpus luteum are given as follows

Estrogenic hormone 50,000 i u or 5 mg. 4 injections in 10 days and followed by a week of no treatment This is followed by 4 injections of progesterone on alternate days After a further 3 days (i.e., a cycle of 28 days) the course of follicular and luteal hormones are repeated

Secondary Amenorrhea—The causes of secondary amenorrhea are diverse and successful treatment will depend upon the discovery of the cause. Secondary amenorrhea may occur under the following circumstances:

(a) In association with other disease, acute infections, anemia, heart disease, nephritis, diabetes, tuberculosis or osteomyelitis

(b) Physical shock (sea bathing, cold showers) and mental causes (fear of or great anxiety for pregnancy, mental disorders).

(c) Change of occupation as in dancers and gymnasts during training.

(d) Change from a warm to a cold climate

(e) Obesity

(f) Endocrine disorders.

1. Hypopituitarism (Frohlich's syndrome or Symmond's disease)
2. Hyperpituitarism (Acromegaly or Cushing's syndrome)

3 Supra-renal disorders (Addison's disease, cortical adenoma)
4 Hyperthyroidism and hypothyroidism (myxedema)
5 Ovarian disfunction

As has been mentioned earlier insufficient pituitary stimulation or imbalance of follicular and luteal hormones may give rise to amenorrhea To determine the cause of the ovarian disfunction an endometrial biopsy is usually performed The patient lies on the couch and a bivalved speculum is passed the cervix is painted with iodine and a sound is passed into the uterus in order to ascertain the direction of the uterine canal The biopsy curette is then introduced and drawn down the upper part of either the anterior or the posterior wall The curette is then tipped into a glass jar containing 5 per cent formalin in physiological saline An histological examination is then made

If the endometrium is atrophic, a primary pituitary defect is postulated and treatment commenced as described under primary amenorrhea

If the endometrium is hyperplastic or cystic, it is due to an excess of estrone The treatment consists of six daily injections of 5 mg of progesterone or 60 mg of pregnandial daily for the same number of days Bleeding usually starts 36 to 48 hours after discontinuation of the hormone

If the endometrium shows persistence of the premenstrual stage in association with a persistent corpus luteum or corpus luteum cyst 1 mg of hexestrol or stilbestrol is given thrice daily for five days As a rule one course of treatment is sufficient unless a cyst is present, when attempts to disperse it should be made If the cyst cannot be dispersed it should be removed by operation

DYSMENORRHEA

From the point of view of therapy, dysmenorrhea may be classified as psychoneurotic, congestive including membranous, spasmodic and ovarian

Psycho-Neurotic Dysmenorrhea

The psychoneurotic factor is often of great importance In some women pain is due to a mistaken belief that menstruation is always associated with pain In others the underlying cause may be a physical or mental shock or an anxiety neurosis In still others it is an opportunity to escape from the boredom of the daily work and the patient's subconscious mind makes the most of menstruation The treatment consists in the correction of the mental attitude toward menstruation, explanation and re-education Analgesics and antispasmodics may also be ordered

℞	Acid Acetyl Salicyl	gr 5
	Phenacetin	gr 5
	Caffeine	gr 2
	or	
℞	Luminal	gr ½
	Pyramidon	gr. 5
	Ext. Hyoscyamus	gr 1

Proprietary medicines like saridon, novalgin or optalidon may also be used.

Congestive Dysmenorrhea.

This variety frequently comes on some days before menstruation. The pain is dull and aching, situated in the pelvis, often ill-defined but may be localised to the affected side. Low back-ache is usually associated. The ache may persist for the first few days of the period or it may disappear with the onset of the flow It may be associated with inflammatory conditions, displacements of or pressure on the uterus, infection of the fallopian tubes or uterine or ovarian endometriomata. Some cases are associated with excessive masturbation or coitus interruptus

Treatment—When an obvious cause is present, treatment should be directed toward its removal Chronic inflammatory lesions are often benefited by ultra-short wave therapy (wave length 6 metres or less). Treatments are given every other day for a course of 12 to 18 treatments If pain still persists operative treatment is imperative. When no cause can be discovered efforts should be made to lessen congestion during periods The bowels should be kept open and coitus avoided before or during periods. Exercises that reduce pelvic congestion are of value Analgesics may be used when necessary

Spasmodic and Membranous Dysmenorrhea.

The pain in spasmodic dysmenorrhea is of colicky nature It is described as "bearing down" or miniature labor pains It may come an hour or two before the period but usually coincides with the flow It is usually localized to the hypogastrium but may radiate to the sacrum, groins or thighs As the cause is different in different patients no one treatment will suit all cases. The following therapeutic measures are recommended:

1 An effort should be made to improve the general health, anemia, under-nourishment, lack of exercise or rest may contribute to lowering the general health

2 If exaggerated uterine or tubal contractions are the cause of pain antispasmodics are of value

R	Phenacetin	gr. 5
	Atropine Sulph	gr 1/100

Sig.—Three times a day for two days before and on the first day of the flow

or

R	Liq Ext Viburn Prunifol	m. 20
	Tinct Hyoscyamus	m. 15
	Tinct Hydrastis	m. 15
	Glycerin	m 20
	Aq Cinnamon	ad oz. 1

Sig.—Three times a day on the day previous and the first day of the flow

3 When the menstrual loss is great and clots form calcium gluconate 7½ grains should be given twice a day for two weeks preceding and during the period. Neogynergen capsules may be given morning and evening when the flow is profuse

4 If the uterus is small, hard and under-developed and the loss is scanty with irregular periods endocrine therapy is indicated If the urinary gonadotrophic hormone is diminished or absent, injections of the follicle stimulating hormone (a course of 12) are indicated If the gonadotrophic hormone content is normal, estrone should be given during the first half of the cycle (Hexestrol 1 mg t i d) and corpus luteum (four injections of 5 mg each) during the second half

5 If there is marked antiflexion or retroflexion of the uterus or a narrow cervix with small os is present, a dilation of the cervix (without curettage) is often of value

6 If a state of sympathetic hypertonia is known to exist in association with dysmenorrhea, drugs which relieve angiospasm and combat ischemia of the uterine muscle, such as padutin (Bayer) 7 minims three times a day for 2 or 3 days before the period and on the first day of the period, are sometime effective in relieving the pain

Ovarian Dysmenorrhea.

The pain originates in one or both iliac fossae and may radiate to groins or thighs The pain of uterine dysmenorrhea is mimicked by pressure over the ovary. It is typically premenstrual and usually ceases with the onset of the flow The same type of pain may be experienced at the time of the ovulation

Treatment is by section of the ovarian nerves, performed by division of the infundibulopelvic ligament with its included blood vessels and nerves between clamps

MENORRHAGIA

Menorrhagia may be due to three types of causes

1. General
2. Endocrine
3. Local

General Causes—These include blood dyscrasia, toxic and infectious processes, high blood pressure, mitral disease, cirrhosis liver and syphilis.

Treatment in addition to symptomatic and other measures is that of the underlying disease.

Endocrine Causes—Insufficient pituitary stimulation hypo- or hyperthyroidism and ovarian disfunction are usually involved

Treatment—If at puberty the uterus is found to be infantile and the fibrous tissue to muscle ratio is 2 . 1 two lines of treatment are indicated : (a) styptol 1 tablet three times a day is given for 2 or 3 days to increase the

existing uterine muscle to contract ; (*b*) hormones that stimulate growth of sex organs are given (twelve injections of follicle-stimulating gonadotrophic hormones are given over a period of 6 weeks, supplemented if necessary by estrin)

If there is preponderance of elaboration of estrin over progestin, treatment consists of injections of 5 mg corpus luteal hormone on three consecutive days commencing just before the periods or on the first day of the period

Later on during the menstrual life menorrhagia is usually due to failure of the luteinising hormone of the pituitary lobe (pregnyl) to stimulate the corpus luteum Treatment therefore consists of injections of pregnyl or the luteal hormone

At menopause the ratio of fibrous tissue to muscle again reverts to 2.1 Treatment consists in the exhibition of the follicular hormone Hexestrol 1 mg. is recommended three times a day.

The testosterone treatment of menorrhagia has been considered under the male hormone

Local Causes—Among these are acute, subacute and chronic endometritis, tuberculous endometritis, fibrosis uteri, chronic subinvolution, fibromyomata, displacements, carcinoma of the uterus or cervix and pelvic inflammatory conditions Treatment of these conditions is the domain of a gynecologist A brief reference only is, therefore, made to some of the important conditions.

Acute Endometritis—Fowler's position, hot application to the lower abdomen, sulfa drugs (sulfathiazole or sulfamerazine 1 G every 8 hours)

Chronic Endometritis—Short wave applications and sulphonamides

Tubercular Endometritis—In early cases radium in menopausal dose, if there is much caseation and discharge, hysterectomy. If the patient is poor surgical risk, calcium, cod liver oil, helio- and X-ray-therapy)

Chronic Subinvolution—Displacements are rectified by a pessary Astringent douches, pelvic diathermy, ergot and hydrastis are other measures In refractory cases radium or surgery is indicated

Fibromyomata—Surgery is preferable to radium or deep X-ray therapy in women under forty Radium and deep X-ray therapy have a lower morbidity rate than operation The advantages of X-rays over radium are that hospitalization is not required and no anesthetic is necessary.

Malignant Disease—The value of a diagnostic curettage to exclude malignancy cannot be overstated Treatment is palliative, by radium or operation At present radium treatment has largely superseded operation in the treatment of cervical or uterine carcinoma

IRREGULAR VAGINAL HEMORRHAGES

Hemorrhages may occur ·

1. From the vagina . vaginitis ; vaginal adhesions ; ruptured varicose veins , neoplasms and trauma.

2 From the cervix : erosion ; polyp, cervicitis, sarcoma or carcinoma.

3 From the uterine fundus blood disease ; threatened incomplete or missed abortion, hydatidiform mole, chorionepithelioma, ectopic pregnancy ; uterine polyp ; sarcoma or carcinoma, degenerating fibroid, menopause, metropathia, retention cysts and ovarian tumours

4 From the tube. malignant disease

Treatment—The treatment is that of the cause and a complete gynecologic examination should be made to arrive at a precise diagnosis In what follows a brief outline of treatment for some of the more important causes of irregular hemorrhage, is given

Cervical Erosion—The erosion is cleansed of mucus by a tampon soaked in a solution of potassium hydroxide It is then cauterized by iodised phenol or a 1 per cent solution of picric acid in spirit and tampons of boroglycerin inserted nightly The treatment is given twice during the week and if necessary repeated In superficial erosions this is all that is necessary

In deeper erosions a heat cautery is used This is done with the cautery needle in or more different directions radiating from the external os The intervening parts are cauterized in a punctate manner The cauterized part is dried with a sterile swab and iodised phenol applied A boroglycerin tampon is inserted and removed in 12 hours Nightly tampons of boroglycerin are inserted if the discharge is excessive

If the erosion is combined with a tear, treatment is operative If the tear is not extensive a trachelorrhaphy is performed, excising the eroded area and repairing the tear

Malignant Disease of the Cervix—Treatment is either by radium or surgical The only operation worth considering is Wertheim's abdominal hysterectomy.

Threatened, Incomplete or Missed Abortion—If the woman is not in distress and there is no vaginal bleeding, she may be left alone until the normal time of delivery It is, however, worth while trying three intramuscular injections of 5 mg each of the estrogenic hormone on each of the three successive days combined with a medical induction This will sometime bring about spontaneous abortion. If emptying of the uterus is indicated the cervical canal can be plugged with 2 or 3 laminaria tents, the vagina packed and a medical induction given It is often possible to do this without an anesthetic. Such treatment induces dilatation of the os After 24 hours or so, the mole or fetus and placenta, will be found in the vagina If these results are not achieved the cervix will be dilated to such an extent that it is possible to extract the contents easily Evacuation of the uterus should be terminated by an intra-uterine douche, and a gloved finger passed round the uterine wall to make sure that no product of conception has been retained

Hydatidiform Mole—If there are no urgent symptoms a drug induction as for labour can be given, and repeated within 48 hours If this fails or if delay is undesirable, laminaria tents are introduced and the vagina packed

A dose of castor oil followed by an enema can be given before the insertion of the tents. Three doses of 5 grains of quinine sulphate are given every 2 hours, followed by pituitrin 2½ units hypodermically at half-hourly intervals, a few hours after the insertion of the tents.

If the entire mole is not passed, an anesthetic is given and a gloved finger passed into the uterus with the patient in the lithotomy position. A hypodermic injection of ergometrine 0·5 mg. and a hot douche are given while the patient is on the table, and the uterus evacuated.

When the uterus is enlarged above the umbilicus, or there has been considerable bleeding or the patient is very toxic, a hysterectomy should be carried out and the uterus emptied under direct vision

The patient should be seen at regular intervals after this as half the cases of chorion epithelioma follow hydatidiform moles.

Chorion Epithelioma—The treatment is by radium, X-rays or operation

METROPATHIA HEMORRHAGICA

The condition is associated with absence of a corpus luteum in the ovary, and persistence of one or more follicles filled with the follicular secretion The history is one of a spell of amenorrhea followed by a period of continued bleeding

Treatment—In young patients corpus luteum is administered; 5 mg are given daily for 3 or more successive days Should the condition return the treatment may be repeated

The use of testosterone in treatment of metropathia has already been considered.

If the patient is nearing menopause, radium may be used to render the endometrium inert If this is not available hysterectomy should be considered.

Retention cysts either follicular or luteal may disturb the rhythm of the menstrual cycle and give rise to irregular bleeding from the uterus One or both ovaries may be found to be enlarged and by gently compressing the cyst between fingers it may be possible to rupture it. Force must not be employed

On several occasions two administrations of deep X-rays to the pelvic field on the side of the ovary concerned have brought about disappearance of the cyst. A dose of 200 r may be delivered to the affected side

If the disturbance persists, a laparotomy is performed and the cyst enucleated or resected failing which the ovary is removed. Post-menopausal bleeding may be due to malignant disease and a careful gynecologic examination should be made to arrive at an early diagnosis.

Irregular bleeding in young children may be due to gonococcal vulvo-vaginitis, a grape-like sarcoma of the cervix or precocious puberty.

Bleeding after hysterectomy may be due to carcinoma in the cervical stump or the failure to remove all the endometrial tissue.

THE MENOPAUSE

The menopause heralds the end of a woman's fertile life. It usually occurs between the ages of 45 and 53 but may be earlier or later. For many women it is a period of great psychological strain due to the suppressed fear of never being the same again.

The symptoms that may occur at menopause are: hot flushes, feelings of sudden chill, changes in blood pressure, sweating, giddiness and headaches, increase or loss of weight; depression, anxiety states, hypochondria, insomnia, anorexia, dyspepsia, flatulence and constipation, pruritus, falling hair, breast pains, atrophy or deposition of fat, increase or diminution of libido, pains in joints and aching in the limbs.

Treatment—The patient should be told that menopause is a natural process, that many women pass through it without unpleasant symptoms of any kind and that there is no need to anticipate trouble. A woman at this time of life should take plenty of exercise and restrict the fats and carbohydrates in the diet to avoid putting on weight. Strong tea, coffee and condiments should be avoided. Constipation must be prevented and sufficiency of rest and sleep ensured.

Diethyl stilbestrol should be given by mouth in doses of 0.5 mg. daily. After a time the dose may be reduced to 0.1 mg. daily. If nausea or vomiting occur hexestrol or dienestrol may be substituted. It is less potent but also less toxic.

If symptoms are more severe stilbestrol may be given in doses of 1 mg. three times a day for a short period. As improvement takes place, the dose should be reduced.

Thyroid gland may be given in small doses if there is tendency to obesity, loss of hair or depressive forms of neurosis. If emotional crises are present bromo-valerian or phenobarbitone are of value.

STERILITY

Approximately 25 to 30 per cent of all cases of sterility are due to faults in the male. This is a fact that needs to be well emphasized.

Treatment in the Male—An inquiry should be made if the man has had a previous marriage. If so, was it fertile? Inquiry should also be made with regard to evidence of gonorrhea in the past or presence of any constitutional disease such as anemia, syphilis or diabetes. If any of these conditions are present, appropriate treatment should be offered.

Investigation should be made for impotency, ejaculatio precox or subnormal seminal standards. The normal average seminal fluid should not fall below the following standard: volume 5 to 6 c.c., pH 7.8-8; spermatozoa 60 million per c.c.; motility 70 per cent; normal forms 80 per cent. If azoospermia or necrospermia are present treatment is very unsatisfactory. In case of subnormal counts, etc., attention is paid to general health and perandren

5 mg. injected twice weekly for six weeks If no improvement results injections of 500 units of ant pituitary gonadotrophic hormone are commenced Two or three injections are given in a week for a total of 12 injections

Treatment in the Female—Nearly 20 per cent of the cases of sterility are due to non-patency of the fallopian tubes Out of the remaining a large proportion are due to vaginal discharges, fibromyomata, endometritis, failure of ovulation or endocrine disorders An effort should, therefore, be made to arrive at a precise diagnosis of the cause When this has been discovered treatment should be directed toward its removal

An inquiry should be made from the woman with regard to.

1 *Intercourse*—Does intercourse take place normally? Is the semen deposited in the vagina? If so deposited, does it stay in or immediately run out? If last, a pillow should be placed under the thighs to prevent its escape

2. *Sterile Periods*—Is the coitus performed at optimum times for conception to take place? (This is usually between the 10th to the 17th day counting from the first day of the period in a 28-day cycle) Or is it performed during so-called sterile or safe periods

3 *Fertility*—If she comes from a stock with high fertility, prognosis is good, if the family history indicates a low fertility ratio, hope is scant

4 *Previous History*—The patient's previous history for discharges, etc. (gonorrhea) should be investigated and if any positive evidence is found, it should receive appropriate attention

A complete gynecological examination should then be made for presence of any abnormalities Vaginal discharges, occlusion of the os by a tenacious plug of mucus, an infective state of the uterine wall, a submucous polypus or fibroids which fill the lumen or compress the isthmal end of the tube, if present, should be treated appropriately

If the utero-salpingo-graphy reveals non-patency of the tubes the following treatment is recommended

1. Five injections of estradial benzoate 50,000 I B U. (5 mg) at 5 day intervals.

2 Ultrashort wave therapy to the pelvis

3 *Repeated Insufflations*—Tubal insufflation should be repeated after these treatments to find out whether patency and improved peristalsis have resulted. If not operative measures for restoration of patency should be resorted to If obstruction is found at the isthmus, the affected part should be excised and the tube re-implanted in the uterus If the obstruction is at the fimbrial end, this can be opened up and if necessary after excision of a portion, a cuff of tube wall is turned back on itself and stitched in place by fine suture. If the obstruction is at the ampulla the narrowed one can be incised and the divided ends placed in the lumen.

When investigations suggest failure of ovulation, follicular stimulating gonadotrophic hormone is given in doses of 1 c c. three times a week for the first two weeks of the menstrual cycle. As an alternative if the patient has difficulty in attending for frequent injections, 1 c c of the follicle stimulating gonadotrophic hormone is injected on 10th and 11th days of a menstrual cycle and 2 c c together with 50,000 I. B U. of estradial benzoate on the 12th day Coitus should take place on the 13th or the 14th day of the cycle

If it is suspected that there is a thick tunica albuginea or adhesions round the ovary, a laparotomy may be performed if the patient is willing, the adhesions freed and a wedge resection of the ovaries with closure by eversion performed.

An unhealthy state of the endometrium can be treated by curettage with injection of glycerin into the uterine cavity. If bleeding occurs at the time of ovulation and interferes with embedding of the ovum, 5 mg of progesterone should be injected on the day before the anticipated onset

Hyperemesis Gravidarum

In mild cases in which there is only an exaggerated morning sickness, the patient is put on a carbohydrate diet, including fruit, sherbet, jellies and starchy food It is useful to add vitamin B concentrates such as bemax or marmite, and administer an anti-histaminic like dramamine 1 tablet three times a day Frequent light meals (six small meals) are preferable to heavy meals at longer intervals It is most important that the patient takes a light nourishment such as Benger's food, Horlick's milk, glucose solution, fruit juice or even barley sugar on awakening in the morning The fluid intake should be ample The bowels should be kept open Encouragement and reassurance are of the greatest value.

In more advanced cases where there is frequent vomiting with or without continuous nausea, but no epigastric pain or jaundice, where very little food is retained and dehydration appears, more stringent measures are necessary The patient should be moved into a nursing home or a hospital away from relations. She should be kept in bed and all food by mouth stopped Glucose (10 per cent in 0 5 per cent normal saline) should be given by the rectum as a continuous drip If the rate is kept slow (10 ounces per hour) it may be possible for the patient to retain 4 to 5 pints in 24 hours For sedation 40 grains of bromide or 30 grains of chloral may be added to the glucose saline. Hormone therapy with corpus luteum hormone or suprarenal cortical extract has not given uniformly good results The anti-histaminics (benadryl, avomine, dramamine), however, have been found to be of value.

As vomiting ceases the patient is given sips of water and in 24 hours she may drink freely No food is given by mouth unless the patient asks for it, and then the diet is on the lines described for mild cases

In the most severe cases where vomiting is continuous with epigastric pain, jaundice, complete inability to retain food and marked dehydration, treatment has to be still more vigorous A 10 per cent solution of glucose in 0 5 per cent normal saline should be given intravenously by the continuous drip method,

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the rate being a pint in 4 hours If drip is not possible a pint should be injected intravenously every six hours. In women with small or inaccessible veins 5 per cent glucose in 0 5 per cent saline may be given intramuscularly Insulin, 1 unit for every 3 G. of glucose may be administered to guard against hyperglycemia and for storage of glycogen by the liver.

Calcium gluconate 20 c c. of a 10 per cent solution should be injected intramuscularly daily for protection of liver against action of toxins Sedatives of the bromide group should be given by the rectum. If hiccup is present, it should be controlled by injection of ½ grain codeine hypodermically.

Hughes and Martin (1942) report a case in which a patient pregnant on seven previous occasions having experienced severe vomiting and spontaneous miscarriage each time, was in the eighth pregnancy put on injections of husband's blood about the fourth week when nausea began. Two and a half to 3½ c.c. of husband's blood was injected throughout the pregnancy Great relief was found and the pregnancy went through uneventfully until the 36th week when labor was induced because of threatened toxemia

McGovan et al (1938) report 12 cases successfully treated by use of nitroglycerin 1/100 grain. The patient is asked to lie down for a little while after each meal and a tablet ordered sublingually each time (p c.)

In a few extremely resistant cases, termination of pregnancy offers the only hope of cure

Toxemias of Pregnancy

(Pre-Eclampsia)

Prevention—Pre-natal visits every two weeks during the eighth and ninth lunar months and weekly during the tenth lunar month are mandatory. Two most important preventive measures are: (1) restrict total weight gain to 20 pounds or less, (2) curtail salt intake in last trimester of pregnancy During the last two months add minimal amounts of salt to food in cooking, better none at all, in pre-eclampsia, none whatsoever.

Incipient Cases—Weight gains of 2 lbs a week should excite suspicion and of 3 lbs a week, concern, even though the blood pressure remains normal. Withhold salt and administer magnesium sulfate, 2 Gms every third morning Hospitalise if (1) previously normal blood pressure rises to 140/90 or if, in association with 3 lbs per week weight gain, blood pressure rises to 135/85; or (2) if a 3 lb per week weight gain is accompanied by albuminuria

Mild Pre-eclampsia—The mild form of pre-eclampsia is a syndrome occurring in the latter half of pregnancy and consisting of:

1. A rise in blood pressure (a maximum of 160 systolic or 100 diastolic);
2. Proteinuria (not over 1-2 Gms. per litre); and
3. A sudden weight gain usually with edema over legs and hands

Blood pressure and fetal heart sounds are recorded twice daily Urinary volume, quantitative albumin, and weight gain are recorded every other day Bed rest and reduction of external stimuli is imperative Light sedation is desirable in most cases with phenobarbital 3/4 gr every 6 hours Magnesium sulfate 2 Gms is prescribed every other morning Salt (under 3 Gms per day) and fluid (2500 c c —3,000 c c per day) are restricted

Page advises medical induction of labour if the patient is at or near term

Severe Pre-eclampsia—The severe grade of pre-eclampsia is characterised by (1) rise in blood pressure of more than 160 systolic and usually more than 110 diastolic, (2) the passage of more than 2 Gms of protein per litre of urine, (3) edema, and (4) usually one or more of the following symptoms headache blurred vision or scotomata, epigastric pain and liver tenderness, torpor or irritability

Except for termination of pregnancy, there is no specific treatment An outline of symptomatic therapy, as described by Page, is as follows

(1) The patient should be put to absolute bed rest, disturbing procedures reduced to minimum and mild saline laxatives administered

(2) Observations to be made include blood pressure and fetal heart sounds every 4 hours, except when sleeping; careful recording of fluid intake and output every 12 hours; quantitative determination of proteinuria, microscopic urine examination; examination of ocular fundi, type for transfusion including Rh factor and blood chemical determinations for uric acid, non protein nitrogen serum albumin and CO_2 combining power

(3) For correction of edema, the salt should be restricted to less than Gm per day and fluid intake to 1500 c c daily until diuresis is established ammonium chloride 3 Gms 3 times daily for 3 days may be given Intravenous dextrose, 200-250 c.c of 10 per cent solution may be repeated three times daily if toxemia is acute or if diuresis is not established If diuresis does not occur and especially if serum albumin is below 3 Gms per 100 c c, the administration of plasma may be of value even though its administration does not elevate the serum protein level.

(4) For management of hypertension, phenobarbital sodium 0 1 Gm orally every 6 to 8 hours or magnesium sulphate 2 Gms injected very slowly intravenously or added to the intravenous dextrose solution should be used

(5) In addition to dextrose, the use of (*a*) methionine 2 Gms orally twice a day, together with (*b*) oral vitamin B complex seems desirable for protection of liver.

(6) The prophylactic use of dilantin 0 1 Gm three times daily in all seems rational

(7) If severe pre-eclampsia does not improve after 1 or 2 days of medical therapy, the termination of pregnancy is usually advisable, especially if patient is more than 32 weeks pregnant

Eclampsia—Eclampsia is the same disease as pre-eclampsia with the addition of convulsions Eastman summarises the treatment as follows:

Morphine ¼ g is given when patient is first seen, followed by paraldehyde 35 c c in oil per rectum; the latter may be repeated depending on the activity of the patient, especially with repeated convulsions, 15 c.c every 6 hours or oftener One hour after paraldehyde instillation, give magnesium sulfate, 10 c c of 50 per cent solution in each buttock. Repeat 10 c c. of 50 per cent solution into alternate buttocks every 4 hours for 24 hours Give no more magnesium sulfate if patient is anuric but otherwise continue with same dosage every 6 hours

Insert indwelling catheter as soon as sedative effect of magnesium sulfate is manifest and judge prognosis by urinary output. Any output over 200 c c. per 6 hours is favourable Intravenous glucose, 300 c c. of 25 per cent solution, *every 4 hours is advisable if urinary output is less* than this figure Oxygen by tube, mask or tent should be and given under pressure in the presence of pulmonary edema

Give no thought to terminating of pregnancy until the patient is entirely out of eclamptic state, that is, has had no convulsions and has been clear mentally for 24 hours Then, and only then should pregnancy be terminated either by rupturing the membrane to induce labour, if the cervix is favourable, or by cesarean section, if it is not.

Treatment continues until diuresis and other evidence of improvement occur According to Page, the use of the following drugs and procedures which have proven to be undesirable in eclampsia should be avoided:

1 Intravenous solutions containing saline, sodium bicarbonate or sucrose

2 Pituitrin and pitressin (pitocin may be used when necessary because it is almost devoid of anti-diuretic hormone)

3 Intravenous barbiturates in anesthetic dosages, ether and chloroform;

4 Nitrites and thiocianates,

5 Spinal taps,

6 Purging and dehydration.

Vascular-Renal Disease in Pregnancy

These patients are for the most part chronic hypertensives and will hence show hypertension early in pregnancy. There are often no other symptoms or signs except for headaches and narrowing and tortuosity of retinal vessels The majority of these patients can carry through their pregnancy without detriment to themselves, but in about 25 per cent pre-eclampsia becomes superimposed in the last half of pregnancy and demands termination of pregnancy, especially if it was encountered in a previous pregnancy.

Despite the hazards of pre-eclampsia, fetal death in utero, etc., Eastman has recommended carrying these patients through pregnancy with the following exceptions:

(1) If in a previous pregnancy pre-eclampsia was superimposed on chronic hypertension, the chances of repetition are so great as to render another pregnancy hazardous and also well-nigh futile.

(2) If there is definite evidence of hypertensive heart disease, pregnancy carries grave risks to mother.

(3) If the renal function is markedly impaired, the life expectancy of the patient is poor, regardless of pregnancy, but even moderate diminution of renal function augurs ill for the success of gestation.

(4) Patients with old retinal exudates or fresh haemorrhages will usually show evidence of renal disease also and their outlook in pregnancy is notoriously poor.

(5) Patients whose initial blood pressure is 200 systolic or above and/or 120 diastolic or above encounter a fetal mortality rate in excess of 50 per cent and also a high incidence of maternal complications.

In the presence of any of these five conditions, therapeutic abortion is indicated. Sterilisation is also advisable but these patients are poor operative risks.

Pruritus Vulvae and Kraurosis Vulvae

Patients of menopausal age suffering from pruritus vulvæ are helped by administration of estrin. Care must of course be taken to exclude such conditions as diabetic pruritus vulvæ. In mild cases 1 mg (10,000 I B U) should be given twice or thrice weekly by injection. Larger doses can be used in refractory cases.

Recently encouraging results are reported in the treatment of kraurosis vulvæ with massive doses (200,000 I B U) of estrin.

Vulvo-Vaginitis and Vaginitis

The treatment of vulvo-vaginitis in children consists in the combined use of sulphathiazole and estrin. Estrin should be given by mouth in daily doses of 1,000 I U. Vaginal pessaries of children's size containing 1,000 I U are also available. In addition to treatment by sulphathiazole and estrin, local measures should be exploited.

Recently treatment with estrin has been employed with good results in cases of vaginitis in adults. Trichomonas vaginitis responds particularly well. The treatment is of no use in cases in which the discharge emanated from the cervix.

Habitual Abortion and Threatened Abortion

If habitual abortion is due to corpus luteum deficiency as indicated by deficient secretory hypertrophy on curetting, treatment by luteal hormone is indicated Doses of about 5 I U three times a week before pregnancy and during the early weeks of pregnancy are advised The use of progestin in all cases of habitual abortion should be strongly condemned In some cases there may be evidence of poor development of genitalia when estrin should be given in large doses before the patient becomes pregnant.

Recently intramuscular injection of the husband's blood at 3 to 8 days intervals throughout pregnancy have been advised The dose is 2 5 to 3 5 c c.

Suppression of Lactation

Estrin inhibits the activity of the anterior lobe of the pituitary and thereby the secretion of the lactogenic principle by the pituitary is reduced Large doses of the hormone, 5 mg daily, are usually necessary.

CHAPTER XIV

DISEASES OF THE DIGESTIVE SYSTEM

STOMATITIS

Catarrhal Stomatitis—It is seen most frequently in acute specific fevers The mouth should be kept clean by daily brushing of the teeth and frequent rinsing particularly after each meal In young children mouth should be gently cleansed after each meal by inserting the index finger enveloped in cotton wool soaked in warm water or warm solution of bicarbonate of soda (30 gr to 1 pint)

Aphthous Stomatitis—It may occur in debility after acute diseases and in disorders of the stomach Numerous small ulcers develop which heal quickly under the treatment used for the catarrhal type A stubborn ulcer is best treated by single application of silver nitrate stick The child should be given potassium chlorate 2 to 8 grains by mouth at 4 hourly intervals

Parasitic Stomatitis (Thrush)—One per cent gentian violet in aqueous solution, is applied twice daily As the condition is usually encountered in weak and debilitated infants, efforts should be made to improve the general condition

Ulcerative Stomatitis (Vincent's Angina)—It is a serious type with membrane formation and active ulceration, beginning often on one tonsil, but spreading to involve any part of the mouth or pharynx The gums are generally swollen and ulcerated. Teeth may become loose and fall out, the cervical glands may become involved and rarely even the mediastinum. The presence of characteristic fusiform bacilli and spirilla in large numbers, gives the clue to the diagnosis Diphtheria, pyorrhea alveolaris and scurvy must be excluded.

The mouth should be kept clean by frequent washes The most useful local application is hydrogen peroxide undiluted on a swab and continued in a weaker solution as a mouth wash Other local applications are 10 per cent chromic acid solution, arsphenamine compounds in solution and dyes such as gentian violet and flavine Neoarsphenamine intravenously is not recommended Penicillin lozenges are very useful

PYORRHEA ALVEOLARIS

Careful attention to cleanliness of teeth is an important preventive measure Mouth should be rinsed freely with water after each meal and no food allowed to collect around and between teeth Proper cleanliness must be begun in childhood.

When the disease is already present treatment will depend upon the stage. Tartar should be removed by scaling and artefact stagnation areas like rough fillings, faulty crowns removed. The pockets should be destroyed by cutting away gum Weak tincture of iodine should be applied to the necks of the teeth and edges of the gums every other day. Dentinol, a proprietary

preparation used as a gum paint once a day or on alternate days is of value in early cases In advanced cases extraction is the only cure.

DYSPHAGIA

Acute dysphagia may be due to inflammatory disease or acute ulceration in the gums, tongue, palate, pharynx or esophagus Among principle causes may be enumerated Vincent's angina, tonsillitis, quinsy, diphtheria, syphilis, retropharyngeal abscess, and acute septic pharyngitis In the esophagus acute dysphagia may be due to impaction of foreign body or injury by caustic fluids swallowed accidentally or with suicidal intent

When not acute, dysphagia is most often a problem of difficulty in swallowing with gradual onset and slowly increasing intensity combined usually with some degree of emaciation due to poor intake of food The chief causes may be tabulated as follows

1 Disease of the larynx which has become extrinsic such as carcinoma, tuberculosis, etc The commonest and the most important cause of laryngeal dysphagia is tuberculosis

2 Diseases affecting the junction of esophagus and pharynx—Plummer vinson syndrome, paralytic conditions such as diphtheria, bulbar palsy, myasthenia gravis, hysteria, etc

3 *Diseases affecting the Mid-esophagus*—Carcinoma, rarely pressure of aneurism, mediastinal tumour, retrosternal goitre

4 *Diseases affecting the lower end of Esophagus*—Achalasia cardia, carcinoma, cicatricial stricture, rarely peptic ulcer of the esophagus

Laryngeal Tuberculosis—Insufflation of orthoform or a spray of weak cocaine or a cocaine lozenge ten minutes before food may give relief Food should be semisolid, thick soups, jellies, custard, etc. If even such foods are swallowed with difficulty, Wolfenden position with patient prone and head hanging over the bed during sucking fluids through a glass tube is of value. Injection of superior laryngeal nerve or its resection is of help in suitable cases If epiglottis alone is affected by ulceration, it should be amputated Gastrostomy is occasionally unavoidable

Diverticulum of Pharynx—Treatment is surgical but risk of such treatment is serious

Plummer-Vinson Syndrome—With dysphagia are associated glossitis, atrophic pharyngitis and anemia The disease usually occurs in middle aged women Treatment is that of anemia and passage of a mercury bougie When this is not possible due to presence of webs or bands, operative treatment is required

Carcinoma of Esophagus—This occurs usually at the level of bifurcation of the trachea or at the cardiac end Treatment is palliative In later stages choice must be made between gastrostomy and adequate use of morphine

Achalasia Cardia—Diagnosis is easily made by X-rays Treatment consists of passage of mercury bougies The bougie is left in position for 15 to 20 minutes after which the food can easily be swallowed.

Peptic Esophagitis—Peptic ulcer of the esophagus should be treated in bed on lines similar to gastric and duodenal ulcer

Gastritis

Acute Gastritis—This may result from swallowing of corrosive poisons when the treatment consists of the appropriate antidote Acute gastritis of a lesser severity may arise from indiscretion in food or alcohol in the course of acute infectious fevers or due to a chill

All food excepting water given in small amounts should be withheld for t to 48 hours After the acute symptoms have subsided, citrated or whole i'k or thickened milk are allowed and full diet resumed only gradually

Gastric lavage with a couple of pints of weak sodium bicarbonate solution in suitable cases (*i e*, when no acute irritant has been swallowed and when there is no blood in the vomit) is of value

Chronic Gastritis—Much of the treatment consists in the removal of well known causes, such as alcoholism, pyorrhea, deficient mastication, excessive use f strong tea, coffee or tobacco

Gastric lavage before breakfast and in severe cases before other meals is of value If lavage is for any reason impossible, administration of a teaspoo of sodium bicarbonate in a tumbler of warm water in the morning and befor meals throughout the day, is a good substitute.

Hydrochloric acid is frequently diminished or absent In such cases a dram f the dilute acid in orange juice should be drunk with each meal.

If there is lack of appetite a bitter tonic containing 5 minims of tincture of nux vomica and 30 minims of compound tincture of gentian should be ordered before meals

Iron should be given if there is anemia and the diet should be soft and -quate in vitamins

Peptic Ulcer

The treatment recommended here is a modified Hurst treatment. It consists of two parts strict ulcer treatment and post ulcer regime

Strict Ulcer Treatment—Patient is kept in bed until healing is complete In no case should strict treatment be for less than 4 weeks

Diet—Every other hour from 8 a m to 10 p m. a feed is given It should consist of 5 ounces of any of the following · milk, arrowroot ,Benger's food custard, junket At two feeds, a thick cream soup or a puree of mashed potatoes or cauliflower may be substituted. During the night the patient should have citrated milk by his bedside, so that whenever he wakes he can take a feed A rusk with butter should be taken with three of the feeds Small quantities of water or strained orange juice should be taken between meals

Drugs—Half ounce of olive oil should be taken before 10 a m , 4 p m and 8 p m feeds ; a teaspoonful of atropine mixture (atropine-sulphate 1/150 Gr in 1 dram of water) half an hour before 8 a m , 2 p m and 10 p m feeds A teaspoonful of magnesium trisillicate is given half way between feeds and last thing at night In place of magnesium trisillicate other antacids may be used These are calcium carbonate, magnesium carbonate, tribasic magnesium phosphate, tribasic calcium phosphate or aluminum hydroxide Titralac, a new antacid introduced by Schenley Laboratories, Inc., is a combination of 30 per cent glycine as a buffer and 70 per cent calcium carbonate as an alkalizing factor and produces an acid neutralizing curve closely simulating that of milk The relief is quick and prolonged The dose is one or two tablets

Alkalosis following use of Antacids—As a rule it occurs when excess of alkalies is taken but in susceptible individuals it has followed relatively small amounts Frequency of vomiting and presence of renal disease are prone to induce it , cardinal symptoms are headache, nausea, vomiting, drowsiness and in severe cases uremia may be simulated closely This similarity is enhanced by the presence of albumin in the urine and a high blood urea.

Treatment consists in complete withdrawal of the alkalies and administration of normal saline by mouth, rectum, or even intravenously when coma threatens Ammonium chloride orally 15 grains three or four times a day in capsules is also of value

Other Measures—Recent measures advocated for treatment include pituitary snuffs, mucin, protein hydrolysates, aminoacids, resins, certain detergents, etc These agents owe their beneficial effect to their buffering, protecting, neutralising or nutritive effect

Cheney who advocated the use of fresh cabbage juice believes that it contains an antipeptic ulcer factor (vit U) The dose is 1,000 c c daily Kraemer and Lehman (1947) introduced a synthetic anion exchange resin (Resinat) for removing acids from solution by direct adsorption The dose is 0 5 Gm at hourly interval daily for one week, then 0 5 Gm. each 2 or 3 hours while the patient is awake. The ganglionic blocking agents, etamon and hexamethonium salts, have been employed with success for relief of pain of peptic-ulcer.

Post-ulcer Regime—For the first six months a feed every three hours is important in preventing recurrences. Meat should be avoided altogether

during this period. Other articles to avoid are alcohol, pips and skins of fruit, unripe fruit, nuts, raisins, figs, raw vegetables, pickles, chutneys, mustard, lemon juice, vinegar, etc. No smoking should be allowed if there is indigestion. A teaspoon of magnesium trisilicate should be taken an hour after food and also directly the slightest heartburn is felt. Bowels should be kept open by milk of magnesia or liquid paraffin; no other laxatives should be taken. Aspirin must not be taken on any account; the author has seen many peptic ulcers reactivated after its use. Teeth should be attended to regularly every six months. Special care should be taken to avoid exposure to chills. On the slightest sign of return of symptoms patient should take to bed and a strict diet. The physician should be consulted at once without waiting for symptoms to get serious.

Treatment of Complications

Hematemesis and Melena—An injection of morphin hydrochloride (¼ to ⅓ Gr) with atropine sulphate 1/100 Gr should be given at once. The room is semi-darkened, the head kept low and the foot of the bed raised. The pulse is watched and the possibility of repetition of bleeding kept in mind. In repeated hemorrhage the blood volume should be restored by slow administration intravenously of glucose saline, plasma or compatible blood. Hemostatics either introduced into the stomach directly or given parenterally have not proved of any real value. Operative interference may be necessary in a chronic bleeding ulcer.

Small sips of water may be given from the outset to allay thirst. As soon as the vomiting has ceased the patient should be kept on a pureed and sieved diet of great variety and adequate caloric value. Five more or less natural meals are given, two of them 1 p m and 6 p m being quite large and very varied (Meulengracht).

Perforation—Treatment is surgical.

Pylorospasm—The treatment is by belladonna or atropine and olive oil before surgery is resorted to.

Pyloric Stenosis—Medical treatment as for pylorospasm should be first tried. Gastro-enterostomy is generally found necessary.

Hour glass Stomach—This condition is due to scar formation and contraction of a peptic ulcer on the lesser curvature of the stomach. As the condition may be merely due to spasm, it is necessary to arrive at a diagnosis of organic stenosis before having resort to surgery.

Indications for Surgery—The presence of organic pyloric stenosis, organic hour glass stomach, perforation, chronic hemorrhage, fear of onset of early carcinoma; failure to obtain cure after prolonged and adequate medical treatment.

Choice of operations lies between a simple gastro-enterostomy and partial gastrectomy. The latter operation has a higher operative mortality but it is obviously the correct operation if there is any suspicion of carcinoma. It is also indicated where gastro-enterostomy is followed by a jejunal ulcer.

Cancer of the Stomach

If an early diagnosis is made, partial gastrectomy offers the best chance of a cure Deep X-rays and radium have so far been unsuccessful.

In the latter stages the treatment is palliative. The diet should be liquid or semi-solid and opiates should be given to relieve pain and suffering. The usual duration of life (except in leather bottle stomach of very slow growth) after diagnosis has been made is from 6 months to a year.

Dyspepsia

Dyspepsia is a symptom, not a disease. It may be secondary to other diseases or it may be a primary condition Secondary dyspepsia may be due to (a) vomiting of pregnancy, migraine, cerebral tumours, pulmonary tuberculosis, renal disease, etc., (b) gall-bladder or appendicular dyspepsia

Primary dyspepsia may be organic, *i e.*, due to chronic gastritis, ulcer or cancer of the stomach or it may be functional. It is important to exclude the secondary causes and organic disease of the stomach before a diagnosis of functional or nervous dyspepsia is made.

Functional (Nervous) Dyspepsia

Disturbance of function may involve the function of (a) secretion, (b) motility, (c) both The disturbance may be in the direction of excess or defect giving rise to hyperchlorhydria or hypochlorhydria, atony or hypermotility Two main types are usually described the asthenic and the hypersthenic The main causes of functional dyspepsia are nervous, the asthenic type reflecting a condition of nervous exhaustion, the sthenic type one of hyperexcitability Overwork, strain and worry are important causes and looked at from this point of view nervous dyspepsia is only a sign of a functional disorder of the nervous system

Treatment—The treatment should in the first place take the nervous condition into consideration Factors like overwork, worry, emotional strain should as far as possible be eliminated. In asthenic cases rest and a holiday are indicated. Meals should be small, concentrated and dry. Physical measures like massage and exercise help to tone up the digestive organs Strychnine or nux vomica in moderate doses is helpful. In the hypersthenic type a holiday is also beneficial The diet should be non-stimulating and acid-fixing as in hyperchlorhydria. The best drugs are sedatives like phenobarbital or bromides, antacids and belladonna

Constipation

Three varieties are described.

1. *Colonic constipation.*

2. *Dyschezia*—Due to imperfect action of reflex act of defecation

3. *Deficiency in bulk of the feces* due to incorrect feeding. In a great majority of patients constipation is due to faulty habits of life. These should therefore be corrected.

The importance of establishing regularity of bowel action cannot be overemphasized The patient should go to stool every morning at the same hour whether the desire is present or not In this country most people go to stool the first thing in the morning

Abdominal massage, walking, riding, rowing, bending or other exercises should be ordered for people of sedentary habits Before ordering massage or exercise, inflammatory conditions in the abdomen such as chronic appendicitis, gall bladder or pelvic disease should be excluded

A glass of hot water drunk first thing in the morning is often of value Intake of water between meals should also be increased The diet should contain as much fat (butter, ghee, olive oil) as the patient can tolerate The chapatis or bread should be made from wholemeal flour Cellulose containing vegetables (spinach, cabbage, lettuce, cauliflower, lady's fingers string beans, turnips, carrots, onions, tomatoes) and fresh fruits (prunes, figs pears) should be liberally consumed.

If these measures do not suffice in any particular case drugs may be employed The following are the most useful

Liquid paraffin either plain or combined with agar agar A suitable proprietary preparation is plain petrolagar

Psyllium seed or isphagulla bhusi is probably the most useful remedy in the management of chronic constipation Its action is due to the increase in its bulk from absorption of water

Other useful agents are cascara sagrada (used as liquid extract one to two drams at bed time) or senna pods soaked in cold water several hours before taking

Salines in spite of extensive advertisement are not suitable for habitual use

In spastic colon, atropine 1/60 gr, papaverine 2 to 4 gr or belladonna are great value

Enemata may sometime be necessary particularly in spastic constipation, cachexia or in bed ridden patients

DIARRHEA

Diarrhea may be due to many and diverse causes The stool may contain excess of fat or starch, blood, mucus, pus or deficiency of pigments When small intestines are involved the stools tend to be watery when colon is the seat of trouble they are loose and unformed Common varieties of diarrhea are classified as follows

1. Infective and toxic
2. Gastrogenous
3. Nervous and lienteric

4. Pancreatic and fatty.
5. Endocrine, *e g.*, in Grave's disease.
6 Carbohydrate intestinal dyspepsia.
7. Diarrhea of unknown origin.

It is of the utmost importance that the cause should be ascertained as the treatment will in most cases depend upon the eradication of the cause.

Infective and Toxic Diarrhea—It is a very large group and includes cases due to food poisoning, dysentery, infection with flagellates and intestinal parasites, typhoid fever, organic and inorganic poisons, tuberculosis, ulcerative colitis, the toxic diarrhea of septic states and nephritis. Special and specific methods of treatment are described under appropriate heads. General measures applicable to most cases are : rest in bed and warmth, adequate supply of fluids, a suitable diet and drugs.

Diet—In severe diarrheas all food by mouth must be stopped at the beginning. If there is no vomiting, plain water should be given at frequent intervals by mouth When vomiting is present and there is dehydration, fluids must be given intravenously. A normal solution of sodium chloride with 5 per cent glucose is employed.

The principles of feeding must differ greatly in, for instance, long diseases such as enteric fever and short illnesses such as the simpler forms of food poisoning. In the latter when after 2 or 3 days the acute symptoms are passing off the rigid rule of starvation must be relaxed and feeding commenced gradually. Barley water is used as the first change from water. Whey, arrowroot made with water and chicken broth may be given soon after. Later skim milk, milk, dahi and sweetened fruit juices are commenced. The full diet is restored only gradually.

Drugs—The indications are :

1. *To treat the Cause.*—If the diarrhea is due to amebiasis, suitable antiamebic measures should be employed In flagellate diarrhea, atebrin and stovarsol are of value In bacillary dysentery sulphaguanidine or sulphasuxidine may be combined with opiates. Sulphaguanidine and sulphasuxidine are also of value in ulcerative colitis and cholera. In tuberculous enteritis intravenous injections of calcium chloride are valuable.

2. *To rid the Bowel of an Irritant.*—This is done in simple gastro-enteritis and castor oil ½ to 1 oz. is the most useful drug

3. To arrest severe and continuing diarrhea, which is exhausting the patient the best drugs are bismuth and opium The following is a useful mixture :

R	Bismuth Carb.	gr. 20.
	Sod. Bicarb.	gr. 10.
	Tinct Opii.	m. 5.
	Mist. Cret ad.	oz 1.

Sig.—Three times a day.

4. *To treat Circulatory Collapse.*—This is necessary in severest forms and the measures applicable are warmth, intravenous fluids, nikethamide, etc

Gastrogenous Diarrhea—Diagnosis is made by gastric analysis where free hydrochloric acid is found to be absent Therapy consists in administering dilute hydrochloric acid in one dram dose mixed with a glass of orange juice or lemonade and drunk with meals

Nervous and Lienteric Diarrhea—It can prove to be a great nuisance to some students taking examinations or at social functions Drugs of value are sodium bromide 10 grains or phenobarbitone ½ gr. either alone or combined with tincture of belladonna. Tincture of opium 3 to 5 minims in water may also be prescribed ½ hour before food.

Pancreatic and Fatty Diarrhea—Fatty stools due to imperfect absorption of fats from the stools form the most striking clinical feature Disturbances of calcium and phosphorus metabolism and anemia are also present The treatment in the first place is dietetic. Curds (Dahi), milk and matha are well tolerated. Sprulac (Cow and Gate) is a defatted milk powder and useful. Ripe bananas may be given. Other foods should be judiciously and gradually added

Achlorhydria if present should be treated by administration of dilute hydrochloric acid. Anemia is treated by iron and injections of crude liver extract like hepatex T. Calcium and vitamins B and D are also of value In refractory cases sulfadiazine 2 tablets three times a day may be ordered in addition, for a few days.

Diarrhea in Grave's Disease—Treatment is difficult Opium should be as far as possible avoided. Iodine is of no value An enema made up of 200 to 300 c.c. of warm water to which 30 drops of 1 1,000 solution of adrenalin is added, has been recommended Suprarenal cortical extract (Percorten, Ciba) may also be used Treatment of Grave's disease by Thiouracil will cause general improvement of the condition as well as that of diarrhea

Carbohydrate Intestinal Dyspepsia—The essential clinical features are abdominal discomfort and great gaseous distension Treatment depends upon an accurate diagnosis which may be missed if stools are not examined The amount of starchy foods like rice, potatoes, etc, should be greatly reduced and the cellulose containing vegetables as far as possible avoided Takadiastase 5 grains should be given after each meal. If more is necessary charcoal and kaolin may be given. Elixir peptenzyme is a suitable proprietary remedy.

MEGACOLON (HIRCHSPRUNG'S DISEASE)

A rare condition in which there is infrequency of bowel movement and abdominal distension. The etiology is believed to be a disturbance of the nervous mechanism of the anal sphincter The only certain means of diagnosis is by a barium enema

Treatment is rather unsatisfactory. Hurst strongly advises the use of a conical rectal bougie to overcome achalasia of the rectal sphincter. Parasympathetic stimulation has recently been tried with encouraging results

Enemas and liquid petrolatum (1 ounce twice daily) are given for 5 days. Mecholyl bromide 3 grains is then given twice daily for several months. Sympathetic nerve denervation has been tried but section of the muscle down to the mucosa (Ramstedt's operation) is believed to be more rational by those who believe the condition to be an achlasia.

VISCEROPTOSIS

The persons affected are usually very thin and belong to the hyposthenic habitus. A serious attempt should therefore be made to fatten them, both to improve their general condition and to increase their intra-abdominal supporting fat. The diet should be high caloric, high vitamin and should contain plenty of milk, eggs, ghee, butter, cream and fresh fruit.

An abdominal belt (Curtis, London, or Salt, Birmingham) sometimes appears to give relief. Operations to fix the organs in place are not advised.

REGIONAL ILEITIS (CROHN'S DISEASE)

It is a rare disease in which granulomatous lesions appear in the bowel, most frequently in the terminal ileum. The etiology is obscure. The symptoms are those of a wasting disease, chronic bowel obstruction and diarrhea.

A sausage shaped tumour may be felt and on X-ray examination with barium, a filling defect may be evident. The treatment is essentially surgical. A short circuiting operation may be followed later by a complete resection of the diseased portion of the bowel.

MUCOUS COLITIS (SPASTIC COLON)

The condition like nervous dyspepsia occurs in people who are not properly adjusted to their situation in life. Clinically the condition is characterized by constipation or alternating bouts of constipation and diarrhea, pain and colic. In spastic colon mucus is generally absent; in mucous colitis shreds of mucus or complete mucous casts of the bowel may be passed.

The treatment should take into consideration the psychological aspect of the case.

Highly spiced, indigestible and mechanically coarse foods should be avoided. Cathartics and enemas should also be forbidden. Liquid petrolatum, agar agar or psillium seeds (isbagul bhusi) may be permitted if necessary. The only drugs of value are sedatives and atropine. The following is as good a combination as any.

R	Sodium luminal	gr. ⅜
	Tinct Bellad.	m. 5
	Syrup. Simpl.	dr 1
	Aq. ad	oz. 1

Sig.—Three times a day before meals

Ulcerative Colitis

It is a chronic inflammatory condition of the bowel with varying degrees of ulceration and fibrosis. Exacerbations of disease during which there are

diarrhea with blood and pus in the stool, wasting and some fever, are followed by periods of remission The etiology is obscure. Some authorities consider the disease to be a sequel of bacillary dysentery Rest in bed is essential The diet prescribed should be high caloric, high vitamin and smooth Crude liver extracts like campolon, hepatex T' etc., are recommended for parenteral use Recently sulfonamide compounds (sulfadiazine and guanidine) have been given with encouraging results Retention enemas containing these drugs in suspension are also of value Treatment by salazopyrin 1 5 Gm every 3 hours for 2 weeks and aureomycin 250 mg every 8 hours or double the dose in case of failure, is strongly recommended.

APPENDICITIS

Acute Appendicitis

The treatment of acute appendicitis is appendicectomy If the diagnosis is made within 48 hours, all are agreed that the appendix should be removed urgently. If the diagnosis is made on the third or fourth day of the disease and there is local peritonitis or appendicular abscess, opinion is divided The immediate school advocate removal as soon as possible irrespective of the time since the onset of the attack, although even followers of this school often stipulate "unless the patient is recovering from the attack"

The delayed school (Ochsner-Sherren) advocate a rigid non-operative regime and while being prepared to operate immediately, they only do so if there are signs of Nature's failure to combat the disease

Diet—No diet is given by mouth, not even sips of water as they stimulate peristalsis Mouth is frequently rinsed with water to keep the tongue and throat moist. Glucose saline is given intravenously On the fifth or sixth day of treatment feeding is commenced if the pulse and temperature are satisfactory Clear soup, Benger's food or fruit juice may be given in small quantities On the next day if all has been well, custard and jelly may be allowed After that the diet is very gradually increased

Drugs—Morphine or other analgesics must not be used, hot water bottle and infra-red lamp may be used for relief of pain and to aid resolution

Sulfonamide drugs should be given parenterally every six hours Recently penicillin has been used with success

Bowels—On the fifth day of disease a small glycerine enema may be given Purgatives must not be used till resolution is complete, that is, the pulse and temperature have been normal for a week and there are no symptoms and physical signs. Liquid paraffin, a dessertspoon twice daily, is then prescribed.

A rising pulse rate, vomiting after the first few hours and pain as opposed to tenderness after the first six hours of delayed treatment are indications that it is dangerous to proceed with the delayed method

Under delayed treatment most cases recover and the appendix is removed after the acute stage has abated In a few cases where symptoms and

signs point to failure of delayed treatment urgent removal of the appendix is indicated

Appendicular Abscess

The immediate school advocate that pus must be let out; the delayed school are of the opinion that small or moderate sized appendicular abscesses should be opened only if they are getting larger or fail to resolve They find that such abscesses often resolve completely under the Ochsner-Sherren treatment. In about three months' time when the appendix is removed, there is usually a remarkable freedom from adhesions

Chronic Appendicitis

The diagnosis is often difficult The treatment is removal of the diseased appendix

INTESTINAL OBSTRUCTION

Intestinal obstruction may be paralytic or anatomic

The cause of anatomic obstruction may be extra-mural as in bands or herniæ, inter-mural as in carcinoma or intussusception or intra-mural as in gall-stones or fecoliths When heart disease, particularly mitral stenosis is present, embolism or thrombosis of the superior mesenteric vessels should be strongly suspected.

Paralytic Ileus—Pituitrin, eserine or acetyl choline by injection are indicated If they do not prove helpful no further attempt is made to stimulate the bowel. Antigas-gangrene serum is administered and continuous intravenous saline therapy instituted Twelve hours later an enema is given. If there is no result another 12 hour period of rest is necessary. The use of the Miller-Abbot tube is invaluable

Anatomic Obstruction—An early diagnosis and prompt institution of treatment is the most urgent requirement The first symptom is pain which is colicky and intermittent at the beginning but later becomes continuous Pain is followed almost at once by vomiting. At first the vomiting consists of stomach contents, later it is green and bilious and as the condition progresses it becomes dark and foul smelling Constipation is usually absolute and not even flatus is passed Some degree of collapse is usually present at the commencement, this becomes marked as the condition progresses

On abdominal examination the most characteristic finding is visible peristalsis and coils of bowel This if seen is almost positive evidence of obstruction The application of stethoscope to the abdomen may elicit turbulent peristaltic sounds In certain forms of obstruction a localised tumour may be palpable Rigidity is usually absent unless peritonitis has set in Distension of the abdomen is a late symptom. Examination of the rectum, hernial orifices and heart for mitral disease, must not be omitted.

Treatment—As soon as a diagnosis is made a competent surgeon should be called in and treatment planned in consultation with him Laparotomy

should be performed as soon as possible and the cause adequately dealt with. Important adjuvants to surgical treatment are:

1. Aspiration of stomach contents
2. Aspiration of the contents of small intestine by the Miller-Abbot tube.
3. Antigas-gangrene serum
4. Intravenous isotonic saline
5. Blood, plasma or amino-acid transfusion

DIVERTICULOSIS AND DIVERTICULITIS

Diverticulosis—The early stages of diverticulosis are symptomless Later on in a number of patients there are headache, flatulence and colicky pain in the abdomen. Constipation is almost invariable but occasionally attacks of diarrhea supervene.

Treatment should be directed to relieving the constipation and improving the general health Purgatives must not be given Liquid paraffin, plain petrolagar and isphagula (psillium) seeds are of value Occasionally a warm douche of normal saline solution or warm olive oil enema may be given Diet should be bland

Diverticulitis—Inflammation of the diverticulum is rarely encountered. The early symptoms consist of intermittent colicky pain, fever and an indefinite tender mass in the left iliac fossa In a great majority of cases the inflammation settles down after expectant treatment (rest, local-heat and olive oil retention enema) Should perforation occur or fistula form between the bowel and the bladder, surgical intervention is needed

HEMORRHOIDS

A thorough examination should be made to exclude carcinoma, polyp, stricture, luetic condyloma, fissure, etc

Treatment—This is palliative, by injection and by operation

Palliation consists in careful avoidance of constipation and measures designed to relieve itching or pain For chronic constipation liquid petrolatum, petrolagar or compound liquorice powder at bed time are useful In mild cases anusol suppositories are of value

If the piles become inflammed, rest in bed and local compresses of 2 per cent. boric acid solution, followed by Ung hamemelidis may be ordered

If hemorrhage is troublesome an injection of 30 c c of 10 per cent solution of calcium chloride into the rectum once or twice a day may stop it

For severe itching an ointment containing bete-eucaine 1 0, menthol 0 2, dissolved in olive oil and mixed with 10 G lanoline is recommended

When prolapse ar[illegible]
or operative removal

Injection Therapy—With the patient in the left lateral position the speculum is introduced and the obturator withdrawn. The pile to be injected is swabbed with weak tincture of iodine. The 5 c.c. record syringe is filled with a 5 per cent solution of phenol in almond oil. Half to 2 c.c. of the solution are injected into the centre of the pile mass. Injections must not be made too low and below the mucocutaneous line. If there are several piles each is injected in turn, the interval between injections being 4 to 7 days. Six to eight or more injections may be necessary to effect a cure. Only uncomplicated internal piles should be treated.

CHAPTER XV

DISEASES OF THE LIVER

JAUNDICE

Jaundice may be classified as follows.

1 Obstructive jaundice such as occurs in gall stones, tumours, etc.

2 Toxic and infective jaundice as occurs in poisoning due to arsenicals, cincophen, gold compounds, chloroform, etc., and in catarrhal jaundice, syphilis, malaria, yellow fever, Weil's disease, etc

3 Hemolytic jaundice occurs in conditions of excessive blood destruction such as acholuric jaundice and pernicious anemia.

More than one of these three types may be present in individual diseases

CATARRHAL JAUNDICE

It occurs in isolated cases and in small epidemics All recent evidence seems to show that the disease is a toxic infectious hepatitis As a rule it is not a serious condition but no case must be taken too lightly. The average duration of an attack is from three to six weeks though some jaundice often persists for a long time in a few patients otherwise apparently quite recovered.

Treatment is on general lines Bed rest throughout the period of jaundice is ordered The diet should be low in fat but should contain adequate amounts of carbohydrate and protein In acute cases administration of plasma is necessary to sustain the plasma proteins Bile salts and magnesium sulfate are given to promote flow of bile Vitamin B-complex is said to hasten recovery Among recent additions to the treatment of liver disease are choline 2 to 3 gm daily or methionine 6 gm daily Methionine is present in large amounts in skim milk.

OBSTRUCTIVE JAUNDICE

The commonest cause is the presence of a gall stone in the ampulla of Vater. Next in frequency as a cause of obstructive jaundice is an inflammatory obstruction, as seen in cholangitis The so-called catarrhal jaundice may begin as obstructive jaundice but toxic liver damage soon occurs Carcinoma of the head of pancreas is also a common cause in older people

Treatment—The treatment probably should be conservative and symptomatic for several days Carbohydrates, particularly intravenous glucose, should be given freely Proteins should not be restricted and plasma given intravenously is helpful. Vitamin K should be administered to help restore the prothrombin level to normal If it is given orally the dose is 1 mg three times a day and is given together with bile salts to promote its absorption If vitamin K is given parenterally bile salts are not required.

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If surgical indications are acute, operation is not deferred. Should obstruction not be relieved within a few days, surgical intervention is neces

ACUTE YELLOW ATROPHY

It may occur in several conditions, for instance, in eclampsia, yellow f use of certain drugs (arsenicals, atophan, carbon tetrachloride); and in ind from exposure to certain volatile solvents In a number of cases the eti is obscure. Fortunately the disease is uncommon Treatment is highly satisfactory Glucose should be given freely by mouth and intraven Insulin may be given Toxemia, delirium and other symptoms are treate usual lines Methionine has recently (1945) been employed in doses of 12 daily and the reported results are very encouraging.

PORTAL CIRRHOSIS

The etiology of the disease is not properly understood. Excessive us alcohol is regarded as by far the commonest cause The disease is, how known to occur among tee-totalers and infections, toxins, avitaminosis or exce use of condiments may be concerned

The treatment of atrophic cirrhosis has been revolutionized during r years by the introduction of a new diet and choline or its predecessor methio

Lester M Morrison (1946) and a number of other observers have publ reports of carefully controlled series of cases treated in this manner and the re are impressive

Diet—The diet should consist of 200 to 300 gm. of protein, 300 to 500 of carbohydrate and 50 to 100 gm fat with a total caloric value of 2,500 to 4 This is prescribed in liquid or solid form as the patient can take Lean m usually 3 servings, skim milk 6 to 8 glasses and cottage cheese and eggs are t daily. An adequate amount of vegetables and fruit juices is allowed.

Liver Extract—Liver extract is administered in doses of 100 to 120 c c we intravenously for long periods.

B-Complex—The liver extract is reinforced by 1 c c. daily of a good prepara daily of B-complex Hypobeta (Sharpe and Dhome), combex (P. D & (or B-complex (Lilly) are suitable

Other Vitamins—In addition to the above, 1 capsule daily of a multivita preparation—esdavite, multivite or vigran—, and two capsules of a high pot vitamin B-complex preparation are given three times a day Vitamin K ibed in doses of 30 mg daily for many periods of a week alternated to 6 day periods without the drug

Blood or Plasma Transfusions—Blood transf[illegible] of value when [illegible] is anemia and to alter lowered protein level [illegible] protei[illegible] low, plasma is better

Methionine and C[illegible] o grams of [illegible] given capsules.

When ascites is present mercurial diuretics (neptal or esidrone) and paracentesis may be required.

Mortality has been lowered by this treatment and remissions recorded even when ascites is present

Itching may be relieved by the use of calamine lotion containing 1 per cent phenol or ergotamine tartarate 1 mg subcutaneously daily or calomel in ¼ Gr doses up to 2 grains a day for 3 or 4 days

Hematemesis—Rest, morphine ¼ grain, and other measures discussed under peptic ulcer should be utilized Surgical treatment is risky and of little value

Biliary Cirrhosis

The chronic inflammation of the liver is secondary to infection of the gall bladder or biliary passages; if recognised early, removal of gall bladder and duodenal drainage may arrest the process.

Syphilis Liver

The history and a positive W R. are important for diagnosis Fever is often present In doubtful cases therapy with potassium iodide and bismuth injections is indicated Later on neoarsphenamine should be given in small doses Penicillin in large doses 40,000 units every 3 hours for 12 days is recommended The initial doses should be small

Carcinoma Liver

Carcinoma of the liver is usually metastatic although primary cancer sometimes occurs There is rapid enlargement of the liver in middle life or later, associated with jaundice and cachexia Differential diagnosis has to be made from cirrhosis, abscess, syphilis and hydatid Treatment is symptomatic and a fatal end inevitable

Carcinoma of the bile passages causes a painless, progressive jaundice similar to that from cancer of the head of the pancreas

CHAPTER XVI

GALL BLADDER DISEASE

Acute Cholecystitis

Acute cholecystitis may belong to one of the following varieties.

1 Acute catarrhal cholecystitis

2 Acute suppurative cholecystitis.

3 Acute phlegmonous cholecystitis

The second and the third varieties are fortunately rare and call for emergent surgery

Catarrhal cholecystitis is fairly common and is to be regarded as a milder form of infection of the biliary passages It gives rise to a flatulent dyspepsia and to pain, rigidity and tenderness in the right upper quadrant of the abdomen Unless it is cured early, it almost inevitably ends with the sequel of gall stones Cholecystitis without stones can give rise to forms of acute and chronic illness that can scarcely be differentiated from that due to gall stones

Bed rest is important The diet is low fat, high carbohydrate and high protein Fried and greasy foods are disallowed and, spices and stimulants reduced to a minimum Bland foods are allowed in small amounts given frequently If obesity is present, weight reduction is advisable

Vitamin B complex and vitamin K are of value

Sedatives such as phenobarbitone and anti-spasmodics like belladonna (up to 1 c c of the tincture t i d) or trasentin (50 to 75 mg t i d) are often useful Bile-salts such as sodium dehydrochlorate (0 2 to 0 4 Gm t i d) after meals help in increasing the flow of bile. So also does olive oil taken with meals A small dose of magnesium sulfate taken daily is beneficial in some cases

Chemotherapy with sulfathiazole or sulfadiazine 1 Gm. every 4 hours or a course of penicillin or penicillin combined with streptomycin should be tried before resorting to surgery

Chronic Cholecystitis

When chronic cholecystitis occurs without any gall stones being present, the palliative treatment is similar to that already described. If symptoms persist in spite of treatment surgery should be considered

Cholelithiasis

Chronic cholecystitis is often complicated by the presence of gall stones The diagnosis is made by the anamenesis, careful physical examination and radiological examination of the gall bladder after ingestion of a suitable

contrast material Gall stones, as has often been found at autopsy may be silent or they may give rise to a variety of clinical pictures

Attempts to remove gall stones by medicinal measures have so far not met with great success Nevertheless the following have been suggested: a dessert spoon of olive oil before meals, dehydrocholic acid 4 grains 4 times a day by mouth combined with atropine 1/120 grain 3 times a day and nitroglycerin 1/120 grain 3 times a day on alternate days

The treatment of cholecystitis associated with gall stones differs in no way from that of uncomplicated cholecystitis Gall stone colic is treated by rest, local application of heat and an injection of ½ grain of morphin or 75 mg. (1¼ gr) of trasentin hypodermically More recently 30 to 50 mg of papaverine hydrochloride has been given intravenously to relieve the pain Glyceryl trinitrate 1/120 grain may also be used Two very useful drugs for relief of spasm and pain are depropanex (Sharpe and Dhome) and pethidine (Roche or I C. I) The former is given as injections and the latter by mouth or parenterally.

When a diagnosis of gall stones has been made the question of operative treatment often crops up Some surgeons consider the mere presence of gall stones an indication for surgical removal This enthusiasm is not shared by many That they are present in many cases in which they are never recognised is shown by the fact that 30 per cent of all men and 40 per cent of all women after forty who come to autopsy have gall stones

When empyema of the gall bladder or its perforation are diagnosed or there is impaction of stone in the common bile duct as shown by completely obstructive jaundice, surgical treatment is imperative In other cases the decision should be made after considering the severity of the symptoms and the severity and frequency of attacks of gall bladder colic.

CHAPTER XVII

PANCREATITIS

ACUTE PANCREATITIS

The disease is frequently associated with cholangitis, cholecystitis and cholelithiasis Hemorrhagic, gangrenous and suppurative varieties are described.

The onset is sudden and is characterised by agonizing and constant pain in the epigastrium or about the umbilicus There are severe nausea and vomiting and symptoms of collapse. There is extreme tenderness over the region of the pancreas. Muscular rigidity is less marked than in perforated gastric or duodenal ulcers In patients with less severe attacks obstipation is common and acute intestinal obstruction simulated Blood amylase is high

Diagnosis has to be made from perforated ulcer or appendix, intestinal obstruction or acute cholecystitis

The medical treatment consists of relief of pain by morphin, applications of local heat and administration of fluids parenterally. No food is given by mouth during the acute stage If the patient recovers, gall bladder is removed at a later date Nitroglycerin 1/120 grain sublingually, should be given promptly at the onset of a subsequent attack, as it is considered that if the gall bladder is emptied the attack may recede When attacks are frequent Ellman advocates constant gall bladder drainage by small frequent feeds

In severe and fulminant cases an exploratory laparotomy is imperative. The lesser peritoneal sac is drained and the gall bladder removed if possible

CHRONIC PANCREATITIS

Chronic pancreatitis is of two types, the interlobar type which is usually limited to the head of the pancreas and is associated with a descending infection of the biliary tract and the interacinar type usually involving the entire gland and frequently associated with diabetes mellitus

The diagnosis has to be made from lesions of the biliary system and carcinoma of the pancreas The stools in pancreatitis are large, foul and fatty and contain undigested meat fibres The urine may contain sugar. The jaundice if present is irregular There may be a history of biliary colic and there is absence of enlargement of gall bladder. In carcinoma of the head of pancreas there is no history of biliary colic, the jaundice is of gradual onset, steadily deepening, and a palpable pear shaped gall bladder.

For the interacinar, type associated with diabetes, the usual medical measures employed in the latter disease may be employed The diet should be poor in fats and proteins In addition the patient should be given panteric tablets (P. D. & Co.), just after meals. Festan (Bayer) and panacoids (Reed and Carnick) are other suitable preparations.

For the common interlobar type the treatment is similar but surgery should be employed to remove any focus of infection such as chronic cholecystitis or some biliary infection

PANCREATIC CYSTS

Pain in the epigastrium or the left upper quadrant, the development of a palpable tumour in the region of the epigastrium or umbilicus and symptoms of indigestion similar to those of pancreatitis are the common manifestations. Treatment is surgical

CARCINOMA OF THE HEAD OF THE PANCREAS

In the later stages no treatment is of any avail In early stages cholecystenterostomy may be performed

CHAPTER XVIII

DISEASES OF BLOOD

ANEMIAS

Anemias may be classified as follows :—

I. Anemias due to deficiency of factors essential for normal bl formation.

(*a*) Iron.

1. Chronic nutritional hypochromic anemia.
2 Post-hemorrhagic anemia, acute and chronic

(*b*) The intrinsic and the extrinsic factors

1. Pernicious anemia
2. Macrocytic anemia of pregnancy.
3. Macrocytic anemia associated with pathological conditions of the gastro-intestinal tract, *e.g.*, intestinal anastomoses, sprue, idio pathic steat-orrhea, etc.
4 Tropical macrocytic anemia.
5. Macrocytic anemia of liver disease

II. Anemias due to excessive blood destruction

(*a*) Acholuric jaundice.

(*b*) Secondary hemolytic anemias

(*c*) Paroxysmal hemoglobinuria

(*d*) Acute hemolytic anemia of Lederer

(*e*) Sickle-cell anemia

(*f*) Hemolytic anemias of infancy.

III. Aplastic anemia

(*a*) Idiopathic

(*b*) Secondary.

CHRONIC NUTRITIONAL HYPOCHROMIC ANEMIA

Chronic nutritional hypochromic anemia may occur in both sexes and all ages but is commonest among women of the child bearing age.

Prophylactic Treatment—This consists of adequate diet, curative doses of iron in all cases of anemia however mild, and if excessive menstrual blood loss is occurring endocrine treatment, curettage and administration of suitable doses of iron.

Curative Treatment—This may be considered under four headings

(*a*) General measures

(*b*) Symptomatic treatment.

(*c*) Dietetic treatment

(*d*) Iron treatment

(*a*) *General Measures*—Physical and mental rest, good nursing, fresh air and sun shine are important measures Until iron treatment has corrected the anemia, rest in bed is the best form of treatment for alleviating the symptoms of anoxemia, circulatory instability and myocardial weakness, namely palpitation, breathlessness and giddiness

(*b*) *Symptomatic Treatment*—Gastro-intestinal disturbances like anorexia, distension and fullness in the epigastrium, nausea, vomiting, constipation and periodic attacks of diarrhea may occur Improvement of these symptoms occurs within a week or two of beginning the iron treatment particularly if the patient is kept at rest in bed on a light diet In some patients with achlorhydria and chronic gastritis benefit may result from use of an alkaline powder containing sodium bicarbonate, bismuth carbonate and magnesium carbonate ponderosa, of each 20 grains in water, one and a half hours before meals In other cases the alkali may be given on rising and at bed time and the acid (acid hydrochlor dil m 20, glycerin pepsin m 40) in water flavoured with orange juice during meals If constipation is present agarol should be ordered

If atrophic gastritis with or without pain is present, nicotinamide 50 mg should be given t i d and the tongue lesions painted with a solution of chromic acid 10 grains to an ounce of water

Dysphagia improves *pari passu* with rise of hemoglobin Should it persist mercury bougie may be necessary.

Numbness and tingling respond to iron and vitamin B_1

Nervousness, headache, and insomnia should be treated by phenobarbital gr 1 or bromides and chloral 15 grains of each

(*c*) *Diet*—In severe anemia, in the early stages diet should be light Milk, milk puddings, custard, jellies, lightly boiled or scrambled eggs, pounded fish, pureed vegetables and fruits and small amounts of thin bread and butter With improvement in appetite and digestion meat, chicken, green vegetables and fruit can be added The diet should contain 10 to 15 mg of iron per day. Fresh foods, eggs, oat meal, lentils and peas are particularly rich in iron

(*d*) *Iron Therapy*—It is now known that much larger doses of iron are needed to obtain the optimal effect, than was previously considered, that iron is absorbed from the duodenum and upper jejunum in the ferrous state, that ferrous iron is more efficacious than ferric iron, and that bone marrow and hemoglobin are useless. Provided that inhibitory factors like sepsis, toxemia and hemorrhage are absent,

a rise of at least 1 per cent hemoglobin per day should occur with efficient iron therapy. The following preparations are satisfactory.

Ferri. et Ammoni Cit. gr 30 t.i d.
Tablet Ferrous Sulfate gr 3 t.i d. (Fersolate, Glaxo)
Plastules plain one t i d (John Weyth)
Coliron (Evans) teaspoon t.i d.

If dysphagia is present fluid mixtures are preferable

When the preparation of iron to be used has been selected, one-third of the curative dose should be given for a day or two and if no gastric symptoms result, it should be slowly increased to the full dose Iron should always be prescribed to be taken after meals Treatment should continue for one to three months

Recently in those who do not tolerate iron by mouth, intravenous iron in the form of ferrivenin (Benger) has been employed. This is dispensed in 5 c.c ampoules containing 100 mg iron as a 2 per cent solution Each ampoule should theoretically cause a 4 per cent rise in hemoglobin

POST-HEMORRHAGIC ANEMIA

Acute Post-hemorrhagic Anemia—It is due to sudden loss of large amounts of blood or repeated smaller losses occurring in rapid succession

Treatment consists of arrest of hemorrhage and combating the shock

Treatment of Shock—The patient is placed in bed between blankets A small amount of morphine, the smallest required to allay apprehension, and restlessness and to control pain (¼ grain for an adult and 1/12—1/6 grain for a child) is injected The foot of the bed is raised on blocks In severely exsanguinated cases awaiting blood transfusion limbs should be bandaged from below upwards Hot water bottles covered by flannel are kept along both sides of the body When available a radiant heat cradle is used Veritol or nickethamide may be given parenterally every 2 to 4 hours The restoration of the blood volume is undoubtedly the most important therapeutic procedure required When shock is mild in degree adequate amount of water by mouth is enough In more severe cases fluids must be given intravenously For this purpose saline, glucose saline, gum saline, plasma and blood are available Of the fluids mentioned, blood comes first, plasma second and gum saline third

CHRONIC POST-HEMORRHAGIC ANEMIA

The most frequent cause of this form of anemia is occult bleeding from the gastro-intestinal tract The occult bleeding may come from varicose veins from the esophagus or stomach, peptic ulcer, malignant disease, hemorrhoids, or infestation with animal parasites particularly ankylostomata Other causes are repeated nose bleeds, excessive bleeding from the uterus and chronic blood diseases like purpura, hemophilia and scurvy. When the cause of the bleeding has been determined, treatment directed to its removal must be instituted Iron should be given in large doses and attention paid to other measures outlined under chronic nutritional anemia.

MEGALOCYTIC ANEMIAS

The deficiency of the specific anti-anemic factor may be due to: 1. a failure in its manufacture in the stomach giving rise to Addisonian pernicious anemia, anemia following extensive resection of the stomach or its involvement by carcinoma and the tropical macrocytic anemia of women in this country; 2 its defective absorption as in anemia of tropical and non-tropical sprue, and pellagra; 3 its ineffective storage, mobilization or utilization as in anemia of severe liver disease particularly cirrhosis

Treatment—Treatment should be based on an accurate diagnosis after differentiation from other conditions characterized by macrocytic anemia

Treatment of an Acute or Relapsed Case—Specific therapy consists in the administration of liver extract parenterally In uncomplicated cases 15 U. S. P. units are injected daily intramuscularly for a week and thereafter 2 or 3 times per week until the blood count is normal In cases with neurological involvement or those complicated by infection, diabetes or coronary artery disease, etc., 30 to 60 units daily are given for a week and thereafter 2 or 3 times a week till a suitable response has occurred Oral liver extract is not generally advocated because of difficulty in standardisation. Ventriculin (powdered hog stomach) may be used in patients sensitive to liver Folic acid induces a prompt feeling of well being and is followed by a hematologic response but is contraindicated as it does not prevent or arrest C N. S. lesions

Vitamin B_{12} induces both a hematologic and neurologic response Its dose is 10 to 15 micrograms or more twice weekly until remission occurs A suitable preparation for use is Rubramin (Squibbs).

General Measures—These include a diet adequate in calories, vitamins and minerals, ferrous salts by mouth as adjuvant to liver therapy, dilute hydrochloric acid 30 to 60 minims t i d and, choline and methionine to improve liver function.

Maintenance Therapy—The importance of regular treatment for the remainder of his life must be emphasized upon the patient In uncomplicated cases 15 U. S P. units every 1 to 3 weeks are adequate. If C N S complications are present 15 to 30 units every 1 to 2 weeks may be needed. Vitamin B_{12} in doses of 5 micrograms I.M per week is also adequate

Tropical Macrocytic Anemia

The treatment consists of injections of crude liver extract or autolyzed yeast. Purified liver extracts fail to bring about a response J C *Patel* (1948) reports on the successful use of vitamin B_{12} in the treatment of two patients suffering from this condition Minot and Castle commenting on these cases state that the responses are not characteristic of this group

Macrocytic anemia of pregnancy responds to crude liver extract, folic acid or B_{12}. Ferrous salts and liberal amount of proteins are indicated.

Other mycrocytic anemias include those of sprue, in which the drug of choice is probably vitamin B_{12}, and nutritional macrocytic anemia which responds to either crude liver extracts or folic acid or vitamin B_{12}

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Vitamin B_{12} induces both a hematologic and neurologic response Its dose is 10 to 15 micrograms or more twice weekly until remission occurs A suitable preparation for use is Rubramin (Squibbs)

General Measures—These include a diet adequate in calories, vitamins and minerals, ferrous salts by mouth as adjuvant to liver therapy, dilute hydrochloric acid 30 to 60 minims t i d and, choline and methionine to improve liver function

Maintenance Therapy—The importance of regular treatment for the remainder of his life must be emphasized upon the patient In uncomplicated cases 15 U S P. units every 1 to 3 weeks are adequate If C N S complications are present 15 to 30 units every 1 to 2 weeks may be needed Vitamin B_{12} in doses of 5 micrograms I M. per week is also adequate

Tropical Macrocytic Anemia

The treatment consists of injections of crude liver extract or autolyzed yeast Purified liver extracts fail to bring about a response J C Patel (1948) reports on the successful use of vitamin B_{12} in the treatment of two patients suffering from this condition. Minot and Castle commenting on these cases state that the responses are not characteristic of this group

Macrocytic anemia of pregnancy responds to crude liver extract, folic acid or B_{12} Ferrous salts and liberal amount of proteins are indicated

Other mycrocytic anemias include those of sprue, in which the drug of choice is probably vitamin B_{12}, and nutritional macrocytic anemia which responds to either crude liver extracts or folic acid or vitamin B_{12}

HEMOLYTIC ANEMIAS

Hemolytic anemia may be (*a*) primary, (*b*) secondary.

Primary Hemolytic Anemia

There are two varieties: 1 the familial acholuric jaundice; 2 the acquired form of acholuric jaundice When a diagnosis has been made the question of splenectomy should be considered In the familial type of the disease splenectomy may be postponed till the age of 10 to 12 years After splenectomy has been performed, a rapid rise in blood level occurs As the count approaches 3 to 4 millions the progress slows down and, iron and liver are required The patient needs same general care and diet as in dietary hypochromic anemia.

The principal complications are severe hemolytic crisis and acute inflammation of the gall bladder The former requires blood transfusion and the latter may have to be treated by laparotomy.

Secondary Hemolytic Anemias

The underlying cause may belong to one of the three groups: (*a*) Infections and intoxications such as streptococcal and staphylococcal septicemia, gas gangrene, malaria, black water fever, (*b*) Drugs and industrial hazards, *e g*, lead, dinitrobenzene, arsenicals, potassium chlorate, sulfonamides, etc.; (*c*) Other diseases such as syphilis, carcinoma, Hodgkin's disease, tuberculosis The treatment consists in the management of the causal condition, use of suitable hematinics and blood transfusion

In the acute hemolytic anemia of Lederer, repeated blood transfusions are called for In sickle cell anemia which occurs only in Negroes, the treatment is purely symptomatic

APLASTIC ANEMIA

Inhibition of the bone marrow may be due to severe infections and intoxications, poisoning by drugs and physical agents, industrial hazards and exhaustion in terminal stages of long standing diseases

Treatment should be directed towards the eradication of the causal condition, rest, suitable diet, hematinics and blood transfusion. Where the blood level is so low that life is endangered, blood transfusion is undertaken at once and repeated at intervals, in the hope that bone marrow regeneration will occur BAL may prove of value if the condition is due to a toxic agent such as arsenic

If after months of treatment blood picture and the patient's condition continue to deteriorate, blood transfusions should be discontinued and the patient allowed to die under the influence of morphine

SPLENIC ANEMIA

Splenic anemia (Banti's disease) is a syndrome characterized by splenomegaly, hypochromic anemia, leucopenia, no enlargement of lymph glands, a tendency to gastro-intestinal hemorrhages and, in the late stages a tendency

to cirrhosis of the liver. Before accepting a diagnosis of splenic anemia, other conditions in which anemia and splenomegaly are associated should be eliminated

Treatment—The diet should contain liberal supplies of fresh fruit, green vegetables, butcher's meat, liver and kidneys Iron has a definite place in the therapy of splenic anemia and adequate doses of a suitable preparation should be given Blood transfusions are of great value

Splenectomy has been recommended. Davidson is of the opinion that it should be limited to those rare instances in which the splenic tumour is causing a definite inconvenience or there have been repeated attacks of severe pain from infarction or perisplenitis The operation is of little value once definite signs of liver cirrhosis have appeared and particularly if hematemesis has occurred and esophageal varices can be demonstrated by X-rays

POLYCYTHEMIA VERA

Venesection—The effect is temporary At least 40 oz of blood should be abstracted at a time.

Irradiation—Depressent doses are applied to the long bones, sternum and ribs Treatment should be carried out carefully and controlled by repeated blood counts Three to six exposures a week should be made until all long bones have been irradiated The course may be repeated at intervals of 3 to 6 months, depending on blood counts

Phenylhydrazine Hydrochloride—0 1 G in a capsule two or three times a day until 3 or 4 G have been given constitutes the initial course The maintenance treatment should be commenced within a few days of the initial course A dose of 0 1 G to 0 3 G. on one day of each week is the average amount necessary Acetyl-phenyl-hydrazine is as effective and less toxic than phenyl-hydrazine The dose is 0 1 G once daily in capsule for one or more courses of 7 to 10 days, during which the red cell count is carefully watched For maintenance dose 0 1 G is given every 5 to 7 days. Pot Cit gr 30 should be given q.i d during the days phenyl-hydrazine is being given.

Nitrogen Mustard—Nitrogen mustard has recently been used in the treatment of polycythemia vera and the reported results are very encouraging

Radio-phosphorus—Radio-phosphorus is probably the treatment of choice in this disease Remissions of 2 years or more have been obtained from its use The initial dose is 5 to 6 mc It is repeated in 3 to 6 months if remission is not produced

PURPURAS

The purpuras may be primary or symptomatic Primary purpuras are the idiopathic thrombocytopenic purpura and the anaphylactoid purpuras of Schonlein and Henoch The secondary purpuras are commonly the result of severe infection (septicemia, typhus, meningitis, small pox, etc), drug intoxications (sulfonamides, benzol, arsenic, gold, bismuth, mercury, iodides, etc),

chronic diseases of the kidneys and liver, malignant disease, exposure to X-rays or radio-active substances, avitaminosis (scurvy), and terminal states of certain blood diseases (aplastic anemia, leukemias, splenic anemia, Gaucher's disease, etc).

An exact diagnosis of the cause of purpura is important A full blood examination is also essential to assess the degree of anemia present and to establish whether the purpura is of the thrombocytopenic or non-thrombocytopenic variety

Treatment may be considered under two headings, local and general

Local Measures

Bleeding from the Gums—The most effective preparation is local use of Russel's viper venom It is marketed as stypven (B. W & Co) and rusven (Boots) A gauze dressing soaked in the venom solution is applied firmly but without undue pressure A mixture of venom solution and 1 in 1,000 adrenalin may be used as a last resort If venom is not available the bleeding spot is cleaned and gauze soaked in fresh human blood applied. If infection of tooth socket is present the socket should be lightly plugged to allow of drainage

Bleeding from the Nose—This may be controlled by packing the nose with gauze soaked in stypven or stypven and adrenalin after first cocainising the mucous membrane or by obliteration of the bleeding point with actual cautery or chromic acid bead

General Measures

Adrenalin and Calcium—These are indicated when capillary permeability rather than thrombocytopenia appears to be the particular defect or there is co-existence with purpura of allergic manifestations like urticaria, arthritis or edema Adrenalin should be injected hypodermically in doses of 5 to 10 minims three times a day Calcium may be given by mouth or parenterally

Vitamins C & P—As these vitamins play a role in maintenance of the integrity of capillary endothelium their use is worthy of trial when the essential lesion is an increase in capillary permeability, *e g*, Henoch's and Schonlein's purpura Vitamin C 1,000 mg may be injected daily for a week Hesperidin 250 mg or 1 tablet may be given orally 4 times a day.

Liver extract parenterally 2 c.c. daily is of value only when a megalocytic anemia is present.

Hemostatic Preparations—Hemoplastin, neohemoplastin and coagulen (Ciba) are frequently used Mocassin snake venom (Lederle) subcutaneously has been recommended The initial dose is 0 1 c c. Injections are given at 3 day intervals and the dose is slowly increased to a maximum of 1 c c.

Toluidine blue and protamine sulphate I.V. may prove valuable in properly selected cases of peticheal bleeding associated with thrombopenia

Foreign Protein Therapy—Intramuscular injection of 10 c c. of whole blood has been recommended and is worthy of trial.

Blood Transfusion—A single transfusion of 1 pint of blood has been enough to control the bleeding Sometime repeated transfusions of 250 c c and at 3 or 4 days intervals are necessary

Splenectomy—Is advised in patients who are exsanguinated and in whom the bleeding is not controlled by blood transfusion Splenectomy should be preceded and followed by blood transfusion Toluidine blue I V. before splenectomy is also valuable

Vitamin K—Bleeding tendency seen in cases of obstructive jaundice and chronic biliary fistulæ is due to lack of vitamin K which is an essential constituent of prothrombin Menaphthone B P possesses vitamin K activity and is very effective when injected intramuscularly Solutions of this substance should be injected in a dose of 5 mg for 3 days before and after operation in jaundiced patients

HEMOPHILIA

Females of hemophiliac stock should not bear children The patient's mode of life and activity should be so regulated that chances of trauma are reduced to a minimum The dangers of even minor injuries should be explained both to the children and the parents If any operative procedure is to be undertaken, it should be preceded and followed by blood transfusion and other suitable measures

Diet—The diet should be rich in protein of high biologic quality Vitamin C should be given generously both in the form of fruit juice and as concentrates

Blood Transfusion—This is the most effective therapeutic measure in bleeding due to hemophilia In severe bleeding 100 c c transfusions are given at 8 hourly intervals as the duration of the good effect of a transfusion is a matter of hours and not of days The transfusions should be repeated until hemorrhage is controlled

Plasma—If whole blood is not necessary 100—180 c c plasma, fresh or frozen is given for its anti-hemophilic properties Coagulation time is reduced to or near normal and the effect persists 6 to 12 hours

Fibrinogen—By blood plasma fractionation a preparation of human fibrinogen with anti-hemophilic activity for intravenous use is obtainable It not only lacks icterogenic properties but has the advantage of a small volume which can be quickly and easily given However, evidence suggests that refractoriness may more often follow the use of anti-hemophilic globulin than administration of blood or plasma

Local Measures—In local treatment of external bleeding thrombin powder is of great value Russel viper venom 1 in 10,000 and fibrin foam are also useful

Other Agents—Minor hemorrhages may be controlled by local pressure and the application of hemostatic agents such as tissue extracts and especially blood serum Oxalic acid or koagamin (Chatham Pharmaceuticals) I V, may help in some cases

Surgical Procedures—When a surgical or dental procedure becomes necessary in a mild case, it may be safely carried on if just before the incision the patient is transfused and the transfusions are repeated frequently till such time as the

wound is healed. When dental extractions are contemplated, it is best that the dentist prepare a gutta percha or wax mold of the mouth and gums

AGRANULOCYTIC ANGINA

The disease is characterized by an acute onset, pyrexia, necrotic lesions mainly in the buccal cavity, marked leucopenia and an extreme lowering or complete absence of neutrophil polymorph cells It may occur as an idiopathic form or may be secondary to ingestion in susceptible persons of certain drugs, *e g*, amidopyrine, sulfonamides, arsenicals, gold compounds, etc.

Treatment—The offending agent should be withdrawn at once if this is known Pentnucleotide 10 c c is injected intramuscularly 4 times a day. Injection is combated by penicillin 40,000 units 3 hourly until neutrophils return to the circulating blood in normal numbers If a sulfonamide is not the causative agent and infection fails to respond to penicillin, sulfadiazine should be given a trial If the infection agent is sensitive to streptomycin or aureomycin this should be used Blood transfusions are given frequently if the patient is in a serious condition BAL is administered if the offending agent is gold or arsenic Folic acid has been favourably commented upon

The mouth should be frequently swabbed, first with 50 per cent hydrogen peroxide and then with citric acid solution (40 gr. citric acid, 1 oz. water, diluted 1 part in 7 with water before use). If necessary a local anesthetic should be used before swabbing. A high calorie, high vitamin diet, should be ordered and supplemented with additional vitamins.

LEUKEMIAS

Chronic Leukemias

Roentgen irradiation has not been superseded by any of the newer drugs. The treatment should be directed by a radiologist of experience. A typical case of chronic myeloid leukemia will usually do well following irradiation of the spleen with 3 or 4 times 100r anteriorly and posteriorly (250 kilovolts, 70 cm. distance, filtered through 1 5 mm of copper). In a typical case of chronic lymphatic leukemia, there may be considerable benefit from a course of 200r to 300r once around to each of the external lymph node-bearing regions Many exceptions occur Every case calls for individualization

Urethane—Urethane is an ester of carbamic acid and causes a regression of the leukemic process, presumably through inhibition of mitosis The effect is most pronounced in typical chronic lymphoid leukemias and absent in acute leukemias The individual remissions due to urethane seem to be of shorter duration than those produced by radiation and side effects are more pronounced Though it is of great theoretical interest as another agent affecting hyperplastic leukemic processes has been found, urethane treatment does not seem to constitute any great advance The dose is 1 G t i d

Nitrogen Mustards—The dose is 0 1 mg per Kg body weight I V. in saline for 4 successive days The remission obtained is of shorter duration than that obtained by X-irradiation

Radio-active Phosphorus—P32 is administered in doses of 1 mc I V once or twice a week for 2 weeks.

Fowler's Solution—It may be of value when radiotherapy is either contraindicated or not available. The treatment is commenced with 5 minims t i d and gradually increased to 10 minims t i d Thereafter the dose is increased by 1 minim daily until toxic symptoms (anorexia, nausea, vomiting and diarrhea) appear or the W.B C count reaches normal The drug is discontinued for 2 to 5 days and then a maintenance dose of 5 min t i d ordered indefinitely, keeping the patient under careful observation Anemia is treated by ferrous iron and blood transfusions For bleeding tendency blood transfusion and toluidine blue are of value

Acute Leukemia—Repeated blood transfusions may prove helpful Folic acid antagonists have recently been used with benefit Although not curative they have prolonged life for some time The preparations used are aminopterin 0 5 to 1 0 mg daily, amethopterin 3 to 5 mg daily and amino-an-fol 25 to 50 mg daily Dosage should be determined each day guided by physical findings and white cell count Too rapid drop in W B C , diarrhea, stomatitis or ulceration of the mouth warrant cessation of therapy

Arsenic—Arsenic should be used when irradiation is not available Fowler's solution is used The initial dose is 3 minims three times a day This is increased by a minim every 2 days till toxic effects (anorexia, nausea, vomiting, diarrhea, etc.), are produced The drug is then stopped for 2 or 3 days and ¾ of the toxic dose given and gradually tapered off till the desired effect on blood picture is produced

Iron and liver may be given if anemia is present The diet should be utritious and of a high caloric value Butter, cream and foods rich in rbohydrates should be given in liberal amounts Exercise should always be ll within the limits of tolerance Over-work, chilling and infections must avoided

HODGKIN'S DISEASE

The treatment of choice in early cases is X-ray therapy primarily because sions last longer than with HN, It is possible that the best form of therapy in early cases, may be a combination of HN, and X-ray, the HN, being for its effect on proliferating cells which may either be at a distance from cal lesion or so situated as to remain untouched by X-ray

rogen Mustard--Nitrogen mustard is a useful drug in treatment of 's disease, particularly in severe cases with marked constitutional s A course of therapy consists of four to six injections of nitrogen administered on successive or alternate days An initial dose of 4-5 mg n the first day If this dose is well tolerated succeeding doses are by 1 mg It is preferable to inject the material into the rubber tubing flowing saline infusion

ecial value of HN, is in cases of Hodgkin's disease that have become o X-ray

the incidence Another measure of value is administration of opiates at bed time Nepenthe 20 to 30 minims or tincture opii 20 to 30 minims are recommended

ANGINAL FAILURE

Angina of Effort

Diagnosis of angina pectoris must be made from cardiac infarction Angina pectoris is essentially an effort pain, is of a short duration and is not accompanied by shock The pain of coronary thrombosis is of longer duration, occurs when the patient is at rest and is accompanied by evidence of shock. A pain that lasts without intermission for half an hour or more in spite of resting should be regarded as due to coronary thrombosis and treated accordingly

Treatment—The patient whose attacks come on while walking and are exaggerated by continuation of the effort, soon learns that he must stand still when the pain comes In many cases this is all that is required for alleviation of pain In more severe cases a nitrite is required The most popular preparation is amyl nitrite Ampoules or perles of 5 minims are broken in fingers or a handkerchief and a few deep breaths taken with the mouth open The drug suffers from the serious disadvantage of causing unpleasant symptoms (flushing, headache, and giddiness) and of rendering the user conspicuous in public Nitroglycerin or glyceryl trinitrate gr 1/100 (or more in resistant cases) in tablet form, taken sublingually is free from these defects and effective

Prevention of Attacks—The patient should learn to recognise the amount of effort that induces pain He should then faithfully stop short of it

Drugs—Phenobarbital gr 1/2 combined with aminophylline 1½ to 3 grs may be given three times a day Recently papaverine in doses of 1 to 1½ grains 4 times a day by mouth has been reported upon favourably Proger recommends the intravenous injection of a respiratory enzyme Cytochrome *C* in doses of 50 to 100 mg daily for 10 days The effect is cumulative and the benefit lasts several weeks Testosterone propionate 25 mg twice weekly has also been given parenterally with encouraging results Thiouracil or propylthiouracil should be tried in suitable dosage and are in some cases very successful The writer recently treated two refractory cases with results highly gratifying

When re-education and the use of drugs fail, a period of several weeks rest in bed should be ordered If this is also ineffective surgical measures, such as sympathetic denervation, injection of alcohol into sympathetic ganglia, thyroidectomy, or grafting pectoral muscle or omentum on the heart are sometimes recommended

Coronary Infarction

After a diagnosis has been made, absolute bed rest must be enjoined for a period of 4 to 6 weeks Frequent changes in position and passive movements of the legs will lessen the risk of pulmonary emboli The diet

should consist of fluids during the first few days, later on an adequate diet made up of easily digestible foods should be allowed Constipation should be ignored during the acute phase of the disease

Relief of Pain—The following measures are recommended

(a) Morphine 1/6—1/4 grain intravenously;

(b) At the same time papaverine Gr 1½ is injected intramuscularly; and

(c) Heparin in pitkin medium is also given intramuscularly,

(d) Oxygen even if the patient is in good condition is commenced from the start Oxygen should be given either by the nasal catheter or by the B L B mask

If pain is not relieved in 15 minutes after the first injection of morphine, a second dose of 1/6 grain may be injected intravenously. After the initial relief of pain further injections of morphine can be given subcutaneously A second dose of morphine should not, however, be injected if respirations are below 12 per minute. Later in the treatment, sedatives and xanthines or papaverine are of value.

Nitrites are useless for relief of pain and cause further fall of B P in already shocked patients When fleeting pains of anginal nature appear after subsidence of the attack, nitroglycerin may be used as in angina pectoris

Quinidine—Some clinicians advise the use of 3 grains of quinidine sulphate three times a day as soon as coronary occlusion is diagnosed This plan is not generally followed It is certainly a good rule if numerous extrasystoles are present

Insulin—In coronary thrombosis associated with diabetes, insulin should be given only very cautiously It may precipitate attacks by causing a relative hypoglycemia

Digitalis—Digitalis should not be used during the first week, it increases the likelihood of ventricular fibrillation and may cause a ruptured heart The occurrence of congestive failure in cardiac infarction is a grave occurrence It should be treated on usual lines. Organic mercurials and venesection may afford relief in cases with great venous engorgement

Ideally in coronary artery thrombosis the conjoint therapeutic attack at the very outset should be intravenous morphine, intramuscular papaverine and subcutaneous heparin in the pitkin menstruum

Anti-coagulants—Heparin 250 mg in pitkin menstruum i v on the first day is followed by 250 mg of dicoumarin on the second day orally and 100 mg. on subsequent days after prothrombin estimations It is believed that the drugs also act as coronary vasodilators

Rheumatic Heart Disease

The two most valuable measures in the treatment of rheumatism are rest and salicylates

Rest—Complete rest in bed should be enjoined for all children showing symptoms and signs of active rheumatism. These are tonsillitis, fever, arthritis tachycardia, subcutaneous nodules, failure to gain, anemia and a high sedimentation rate The most valuable evidence of quiescence is the return of *sedimentation rate to normal. A minimum period of three months bed rest* is required for even mild cases After signs of activity have disappeared, the return to normal life should be gradually permitted

Salicylates—They are indicated in the presence of fever and joint pains They do not affect one way or the other the progress of the carditis When they fail, the reason is either insufficient dosage or a wrong diagnosis The dose should be from 60 to 100 grains in 24 hours for small children; in older children higher doses are necessary. The following is a suitable formula:

℞ Sodi Salicyl				
Sodi Bicarb	āā	Gr.	10	
Spt Chloroform		m	10	
Aq		dr.	4	such 12

Sig—One dose two or three hourly.

Some patients do not tolerate large doses of salicylates and develop signs of salicylate poisoning These are vomiting, diarrhea, tinnitus, deafness, twitching, convulsions, delirium and coma. Salicylates should at once be withheld and alkalies and fluids pushed. A number of these patients tolerate acid-acetyl-salicyl or calcium aspirin better.

Cortisone—Kendal's compound E in daily doses of 100 mg given parenterally has been found to be of great value in the treatment of acute rheumatic fever and rheumatoid arthritis. As it benefits the muscular and fibrous tissue in rheumatoid arthritis, it is likely that it will benefit the heart muscle in carditis. It is unfortunately not a cure and as in diabetes, treatment has to be given daily. ACTH is also of equal value

Tonsillectomy—If tonsils are septic, they should be removed but only during quiescent periods A course of sulfamerazine or penicillin should be given before and after the operation

Diet—A high calorie, high vitamin diet should be prescribed as soon as the child can take it During acute attacks diet has necessarily to be fluid. Vitamin concentrates like vigran (Squibbs), multivite or esdavite (S & D) should be given in addition

Prevention—An important measure in lessening the number of attacks is *prevention of upper respiratory tract infections.* This is achieved by removal to a warm, dry climate and use of sulfonamides or penicillin.

After-care—In children with no residual cardiac damage, full range of activity may be allowed In others with more or less cardiac damage activity has to be curtailed The question of future occupation in children with cardiac rheumatism needs to be carefully considered.

Subacute Bacterial Endocarditis

The treatment until recently highly unsatisfactory, has been revolutionized by penicillin The patient should be kept in bed, a high calorie, high vitamin

diet prescribed and symptoms treated as they arise Aspirin or codeine may be ordered for headache, infarctions or other painful complications

Treatment—The treatment consists in the use of a suitable anti-biotic Sensitivity of the infecting organism should be determined in each case before commencing the therapy As about 90 per cent of the infections due to streptococcus viridans respond to treatment with penicillin, this should be given in doses of 1,000,000 units daily in divided doses every 3 hours In resistant cases the treatment should be combined with carinamide 4 Gm every 4 hours day and night Treatment should continue for 4 to 6 weeks or longer.

If the infective organism is not sensitive to penicillin, a combination of streptomycine 1 Gm every 6 hours should be combined with penicillin If the organism is sensitive to aureomycine or chloromycetin, this should be given by mouth

PERICARDITIS

The treatment consists of rest in bed and management of the causal condition Rheumatic disease, tuberculosis, chronic Bright's disease should be treated on usual lines For relief of pain salicylates, aspirin or codeine are required In severe cases morphine may have to be administered A useful measure is an ice cap applied to the pericardium The cap should be half-full of finely chopped ice to which common salt is added Counter-irritation by blisters is not recommended

Paracentesis of the sac is rarely needed when a large effusion causes embarrassment of the heart's action or interferes with respiration due to partial collapse of the left lung Cyanosis and dyspnea may be extreme in these cases and the pulse volume hardly perceptible

The treatment of chronic constrictive pericarditis (Pick's disease) is a surgical problem

CARDIOVASCULAR SYPHILIS

Suitable treatment of early syphilis can prevent cardiovascular syphilis Patients over 40 years of age and with uncomplicated aortitis should not receive arsenic at first because of danger of too rapid effect on the lesion and a Herxheimer reaction

Treatment should be commenced with 7½ grains of potassium iodide increased to 15 30 grains three times a day Concurrently with iodide intramuscular injections of bismuth salicylate 0 1 to 0 2 Gm once weekly, should be given for 12 weeks Thereafter neo-arsphenamine 0 1 Gm intravenously once a week, increasing the dose gradually to a maximum of 0 4 Gm of neo-arsphenamine or 0 04 Gm of mapharside, until 10 doses are given In women and less robust males the dose should not exceed 0 3 Gm neo-arsphenamine or 0 03 Gm mapharside. The bismuth and arsenic courses are given alternately for two years without rest periods

Syphilitic aortitis with aortic insufficiency or aneurism is treated similarly but the dosage of arsphenamine and mapharside should not exceed 0 3 Gm and 0 03 Gm. respectively. When the lesion is advanced even without signs of heart failure, arsenicals are omitted

Treatment of syphilitic coronary ostial stenosis should be mild. Potassium iodide 1-2 Gm is given three times a day and bismuth salicylate 0.1 Gm once a week intramuscularly. If the attacks of anginal pain lessen treatment is continued, if symptoms increase, treatment is stopped. Usual treatment of coronary artery disease with angina pectoris is given at the same time

Patients with syphilitic cardiovascular disease with signs of heart failure should receive no specific anti-syphilitic treatment until satisfactory compensation is restored They are put to bed and on a salt free diet. The fluids are restricted to 1,200 to 1,500 c.c

Digitalis should be given in adequate doses and mercurial diuretics injected two or three times a week into the buttocks. When compensation is restored potassium iodide by mouth and bismuth salicylate injections are advised. This treatment is given for two months and omitted for two months in courses, so long as the patient improves.

Studies of treatment of cardiovascular syphilis with penicillin are so far not available, but judging from its effects on early and late syphilis, it is probable that the drug will prove to be of value. As Herxheimer reactions occur the initial doses should be small

HYPERTENSIVE CARDIOVASCULAR DISEASE

From the point of view of therapy it is of the utmost importance to be able to make the diagnosis of hypertension in its earliest stages. Hines and Brown have shown that it is possible to pick out potential hypertensives by the use of Cold Pressor Test Much can be done by suitably planning the lives of these potential hypertensives by planning their diet and mode of life, by protecting them from infections and other avoidable etiological factors, by helping them to avoid a life of stress and strain, by selecting for them a suitable occupation in an attempt to seek a calmer social environment, by encouraging progressive relaxation and repose, by, in one word, changing the social climate.

In planning the management of any case of hypertension due attention must be paid to the underlying cause or causes Hypertension due to some causes is amenable to therapy Among these are septic foci, plumbism, obesity, anemia, metabolic and endocrine factors, anxiety neuroses and a life of stress and strain Septic foci must be eradicated, anemia and plumbism corrected and adequate therapy ordered for obesity and menopausal disturbances Proper rest and relaxation should be encouraged for anxiety conditions Hypertension of renal origin is not so amenable to therapy but when unilateral renal disease is the cause the removal of the affected kidney has often resulted in a cure

A sane mode of living in keeping with the patient's condition is of greater importance than drug therapy. A proper diet is prescribed, the bowels kept open and suitable rest enjoined The patient should be educated to meet all situations in home or in business with equanimity. He should take frequent vacations or spa-treatments if his purse permits

Diet—The key note is moderation In the obese weight reduction is important. Diets should as far as possible be sodium poor If sodium free diet is intended to be given a proprietary milk called lonalac can be given

The virtues of Kempner diet are probably due to its low content of sodium It consists of 6 to 10 ounces of rice boiled or steamed in fruit juice, without salt, milk or fat In addition 700—1,000 c c of fruit juice is allowed (no water). All fruit juices are permitted but tomato or vegetable juices are not. All fruits are permitted with the exception of nuts, dates and dried and canned fruit No salt is allowed Supplements of multi-vitamins and iron are necessary because of obvious deficiencies in diet.

Drugs—The most useful are sedatives; phenobarbitone, bromides or tablets of powdered root of rauwolfia serpentina may be used alone or in combination with xanthines Useful prescriptions are .

1

℞ Ammon Bromid .. gr. 16
Tinct Valerian Ammon. . m 60
Aqua ad ... oz 1
Sig —One dose twice daily after food

2

℞ Phenobarbitone ... gr ½
Aminophylline .. gr 1½
Pulv Rauwolfia Serpentina ... gr 5
Sig —One capsule morning and evening

New Drugs—During recent years a large number of new drugs have been introduced into the treatment of hypertension Chief among these are tetraethylammonium, C, C_6, dibenamine, veratrum viride, priscoline and hydrated ergot alkaloids

Hydrated Ergot Alkaloids—Kapport and Hadorn (1950) and Hurley et al (1951) report that hydergine (cck-179), a combination of dihydroergocornine (DHO-180), dihydroergocriptin (DCS-90) and dihydroergocrystine (DHK-135) was better tolerated and more uniform in its vasodilator effect than any of its components In mild cases of functional or organic vascular diseases oral therapy is recommended In severe cases parenteral therapy should be combined with oral therapy

Dibenamine—This drug is not active when administered orally and the difficulties of intravenous injection preclude its general clinical use In normotensive subjects there is no significant effect on blood pressure, heart rate, or electrocardiogram The drug is more effective in early benign hypertension but not in patients with advanced organic vascular changes It relieves attacks of encephalopathy in cases of malignant hypertension

Thiocyanates—It is the author's opinion that the drug is hazardous and it is time to give it up

Accelerated Sodium Depletion—This is said to be of value and is achieved by restricting dietary sodium intake and increasing urinary sodium excretion by injecting mercuxanthin 2 c c at intervals of 2 to 3 days

Estrogenic hormone has been with profit prescribed for hypertension that accompanies the menopause

Massage, hydrotherapy and short wave diathermy may be useful adjuncts in selected cases

During recent years many operations have been advised and performed. Of these the chief are unilateral adrenalectomy, bilateral subtotal adrenalectomy, thirotomy, celiectomy and splanchnectomy.

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Studies of treatment of cardiovascular syphilis with penicillin are so far not available, but judging from its effects on early and late syphilis, it is probable that the drug will prove to be of value. As Herxheimer reactions occur the initial doses should be small

HYPERTENSIVE CARDIOVASCULAR DISEASE

From the point of view of therapy it is of the utmost importance to be able to make the diagnosis of hypertension in its earliest stages Hines and Brown have shown that it is possible to pick out potential hypertensives by the use of Cold Pressor Test Much can be done by suitably planning the lives of these potential hypertensives by planning their diet and mode of life, by protecting them from infections and other avoidable etiological factors, by helping them to avoid a life of stress and strain, by selecting for them a suitable occupation in an attempt to seek a calmer social environment, by encouraging progressive relaxation and repose, by, in one word, changing the social climate

In planning the management of any case of hypertension due attention must be paid to the underlying cause or causes Hypertension due to some causes is amenable to therapy Among these are septic foci, plumbism, obesity, anemia, metabolic and endocrine factors, anxiety neuroses and a life of stress and strain Septic foci must be eradicated, anemia and plumbism corrected and adequate therapy ordered for obesity and menopausal disturbances Proper rest and relaxation should be encouraged for anxiety conditions Hypertension of renal origin is not so amenable to therapy but when unilateral renal disease is the cause the removal of the affected kidney has often resulted in a cure

A sane mode of living in keeping with the patient's condition is of greater importance than drug therapy A proper diet is prescribed, the bowels kept open and suitable rest enjoined The patient should be educated to meet all situations in home or in business with equanimity. He should take frequent vacations or spa-treatments if his purse permits

Diet—The key note is moderation In the obese weight reduction is
Diets should as far as possible be sodium poor. If sodium free
to be given a proprietary milk called lonalac can be given

heart failure occurs Quinidine sulphate in doses of 6 grains every 4 hours by mouth has been used successfully in many cases. Magnesium sulphate in 20 per cent solution injected intravenously, slowly for the first 5 c c. then more rapidly 5 to 10 c.c. is usually an effective method. Calcium gluconate 10 to 20 c.c. of a 10 per cent solution intravenously will terminate 70 per cent of the attacks Recently Waldman & Pelner (1948), have reported excellent results with an intramuscular injection of 1 mg of neostigmine.

Paroxysmal Ventricular Tachycardia

Treatment consists in the slow intravenous administration of quinidine sulphate (3 to 6 grains) in a pint of normal saline Digitalis must not be used

Prevention—Any etiological factors present should be adequately treated Quinidine should be given in doses of 6 grains three times a day Administration of potassium acetate 15 to 75 grains or calcium by mouth has also been known to reduce the frequency of attacks Digitalis has also been used successfully in a few cases. After digitalization a dose of 1½ grain of powdered leaf daily is usually adequate.

Auricular Flutter

It is occasionally found as a complication of mitral stenosis, thyrotoxicosis, hypertension, or coronary artery disease; it rarely occurs in perfectly healthy individuals without any other evidence of heart disease Nervous excitement, sudden effort, surgical operation or trauma may be precipitating factors The diagnosis is usually made by an electrocardiogram

Treatment—Short paroxysms lasting only a few minutes or several hours, require *no* treatment other than reassurance or rest An ice bag to the precordium and a mild sedative, such as bromides or phenobarbitone, may prove helpful When the paroxysm has lasted more than a few hours digitalis should be given in doses of 3 grains of the powdered leaf three or four times a day till digitalis effect is attained. After this maintenance doses should be given. At times when flutter changes to fibrillation under digitalis therapy, stopping the drug is followed by the return of normal rhythm When normal rhythm is restored further use of digitalis is not necessary If digitalis therapy fails, a course of quinidine (three grains 2 or 3 times daily) may be given

The following should be avoided · fatigue, physical and mental over-exertion; over-eating, excessive use of tea, coffee and tobacco, infections; congestive heart failure Quinidine sulphate 3 grains, two or three times a day is at times of benefit in reducing frequency of attacks

Auricular Fibrillation

A cardiac arrhythmia characterized by absolute irregularity of ventricular action and complete absence of normal auricular systole It may be paroxysmal or persistent It is usually the latter. About 66 per cent of the cases rheumatic in origin; advanced mitral stenosis is usually present Not frequently it is associated with thyrotoxicosis. Comparatively rarely is it to syphilitic cardiovascular disease The combination of angina pec auricular fibrillation is also rare. At times causes such as physical and

neck, tincture of belladonna in 1 c.c. doses, atropine sulphate up to 1 mg (1-60 gr.) or paredrine hydrobromide ½ to 1 grain are indicated in daily rationed doses.

Extrasystoles

Extrasystoles may be the result of nervous, mechanical or chemical stimuli, worry or atmospheric conditions especially increased temperature and humidity, digestive disturbances with distension and intoxications, or toxemias and infections Drugs like digitalis, caffiene, nicotine, calcium, chloroform, arsphenamine, ephedrine and epinephrine may be initiating factors in susceptible persons The diagnosis is rarely difficult The disappearance of the abnormality with the increased heart rate resulting from exercise or inhalation of amyl nitrite, will make the diagnosis of extrasystolic irregularity quite certain Occasional extrasystoles in persons with otherwise normal hearts have no significance Numerous extrasystoles from multiple foci are evidence of myocardial mischief and have a more sinister import.

Treatment—Removal of any possible causative factors should be the first consideration. Septic foci should be eradicated, use of nicotine and caffeine curatiled, durgs like digitalis, ephedrine, etc , temporarily suspended and any gastrointestinal derangement treated. If the causal factor is a sojourn in a hot, humid clime, a change to the hills should be suggested The nervous individual should be reassured and if necessary sedatives like potassium bromide or phenobarbitone prescribed Recently Sampson and Anderson have used potassium acetate in doses of 1 to 5 Gm (15 to 75 grains) with very encouraging results In some patients use of thyroid gland or atropine is of help. In others quinidine 3 gr. t i.d. proves efficacious. Digitalis has proved of value in some patients whose extrasystoles were not the result of digitalis intoxication.

Paroxysmal Tachycardia

Paroxysmal tachycardia consists of rapid, regular rhythm of sudden onset and equally sudden offset, originating in an ectopic focus in the auricles, junctional tissues or the ventricles. It may thus be regarded as due merely to a rapid succession of extrasystoles. As such it depends on the same causative factors The rate rises abruptly from its normal level to 180-240 beats per minute and drops within one beat to its previous level Auricular paroxysmal tachycardia is fairly frequent, ventricular is much less common and the nodal type rare The duration of the attacks is variable, from a few minutes to several days or weeks.

Treatment—In about half the cases paroxysms may be stopped by exerting pressure over the carotid sinus or by ocular pressure. Ipecec syrup 1 to 2 drams, if ineffective repeated in an hour, has been recently recommended by Sprague Morphine sulphate ¼ grain usually stops an attack. Mecholyl ⅓ to ⅔ grain subcutaneously is successful in 75 per cent cases but gives rise to unpleasant symptoms Its effects may be counteracted if necessary by an injection of atropine. Digitalis in the form of digoxin 1 mg or digilanid 4 c.c. intravenously are effective. Digitalis should always be given if

heart failure occurs Quinidine sulphate in doses of 6 grains every 4 hours by mouth has been used successfully in many cases Magnesium sulphate in 20 per cent solution injected intravenously, slowly for the first 5 c c then more rapidly 5 to 10 c c is usually an effective method. Calcium gluconate 10 to 20 c c of a 10 per cent solution intravenously will terminate 70 per cent of the attacks Recently Waldman & Pelner (1948), have reported excellent results with an intramuscular injection of 1 mg of neostigmine

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Treatment—Short paroxysms lasting only a few minutes or several hours, require no treatment other than reassurance or rest An ice bag to the precordium and a mild sedative, such as bromides or phenobarbitone, may prove helpful When the paroxysm has lasted more than a few hours digitalis should be given in doses of 3 grains of the powdered leaf three or four times a day till digitalis effect is attained After this maintenance doses should be given. At times when flutter changes to fibrillation under digitalis therapy, stopping the drug is followed by the return of normal rhythm When normal rhythm is restored further use of digitalis is not necessary If digitalis therapy fails, a course of quinidine (three grains 2 or 3 times daily) may be given

The following should be avoided fatigue, physical and mental overexertion; over-eating, excessive use of tea, coffee and tobacco; infections; congestive heart failure Quinidine sulphate 3 grains, two or three times a day is at times of benefit in reducing frequency of attacks

Auricular Fibrillation

A cardiac arrhythmia characterized by absolute irregularity of ventricular action and complete absence of normal auricular systole. It may be paroxysmal or persistent. It is usually the latter. About 66 per cent of the cases are rheumatic in origin; advanced mitral stenosis is usually present Not infrequently it is associated with thyrotoxicosis. Comparatively rarely is it due to syphilitic cardiovascular disease The combination of angina pectoris and auricular fibrillation is also rare At times causes such as physical and mental

over-exertion, excessive use of tobacco, alcohol, tea and coffee, infectious diseases, trauma and gas poisoning are responsible for paroxysmal or persistent fibrillation. The most characteristic symptom is palpitation, the most serious complications heart failure or embolism. The heart rate is 100 to 160.

Treatment—Absolute rest and digitalization are indicated in cases with congestive failure In the absence of myocardial disease, congestive failure or a history of embolism, quinidine sulphate may be prescribed Digitalis should not be given in paroxysms of short duration, when no congestive failure is present. Should, however, quinidine sulphate prove ineffective, digitalis should be used

Reassurance and sedatives like bromides 15 grains or phenobarbital ½ to ¼ grain, are useful in allaying restlessness An ice bag applied to the precordium relieves local discomfort In some cases ¼ grain morphine injected subcutaneously is necessary to relieve marked restlessness, palpitation or precordial pain.

When thyrotoxicosis is present subtotal thyroidectomy is usually required to correct the cardiac disorder. Preliminary treatment with Lugol's iodine (5 to 10 drops three times a day) for a week previous to operation has a quieting effect on the action of the heart. Recently thiouracil (0 2 G—1 G daily) has been used with great benefit.

Prevention—Focal infections should be eradicated. Physical and mental over-exertion, over-eating, fatigue, excessive use of alcohol, tea, coffee and tobacco and infections should be avoided.

Heart Block.

Heart block may be sino-auricular or auriculo-ventricular It may be of the nature of delayed conduction or it may be incomplete or complete. Stoke's—Adams Syndrome may be associated. An electro-cardiographic study is important. It may occur in the course of infectious diseases such as rheumatic fever and diphtheria. The commonest cause appears to be coronary thrombosis. Arteriosclerosis, congenital defects, tumour, etc, are also causative factors

Treatment—This depends upon the symptoms, the type and extent of heart disease, and the degree of the block In the asymptomatic type treatment should be directed against the causative agent, whether it be local, rheumatic nodules or syphilitic infiltration, or vascular changes. There is often a response to salicylates and iodides Even arterio-sclerotic processes and local circulatory disturbances are in a measure amenable to treatment with iodides, xanthines and nitrites Removal of vagal influence can be accomplished with tincture of belladonna (by 15 m doses) or atropine grain 1/30.

Digitalis may increase the degree of block and seriously embarrass an already impaired circulation by decreasing the number of ventricular beats per minute. In partial heart block with frequent and distressing intervention

of complete block, it is of advantage to digitalize the patient and put him into complete and permanent block with a regular idioventricular rhythm of 40 per minute

In Adams-Stokes attacks there is need for treatment which will stimulate and keep irritable the ventricular pace-maker In an emergency, adrenalin chloride 1/2 to 1 c.c. of a 1 in 1,000 solution may be injected intravenously into the juglar vein, or even intracardially

For prevention of attacks Ephedrine 1/2 grain t i d , or amphetamine mg 10 t i d or paredrine hydrobromide 50 mg by mouth are valuable Ephedrine may be combined with barium chloride in doses of 1 gram

THYROTOXICOSIS

The cardiac symptoms of thyrotoxicosis are palpitation and tachycardia, present continuously when secondary to sinus tachycardia or paroxysmal when due to auricular fibrillation or flutter In older patients with some degree of coronary sclerosis, anginal attacks may be precipitated When the progress of the disease is rapid, edema and other manifestations of congestive heart failure appear It is important that the thyrotoxic background in such cases should be recognized.

In arriving at a diagnosis the following points should be looked for increase in rate and force of the heart, presence of premature beats or paroxysms of auricular fibrillation or flutter, increased pulsation of the vessels of the neck, systolic murmurs, some enlargement of the thyroid gland, the eye sign weight loss, tremor, sweating and increased B M R The increased pulse pressure may give rise to a Corrigan pulse and other peripheral signs

Concepts of therapy in thyrotoxicosis are constantly being revised because of the discovery that overactivity of the thyroid secretion can be controlled by the oral administration of thiouracil and of the more recently described propyl thiouracil Although a few years ago nearly all frank cases of hyperthyroidism came to surgery sooner or later, it is now possible to treat the majority by medical measures alone, with the expectation that the disorder can be kept under control by continuous or intermittent treatment In some cases prolonged remissions may be induced and in some these may be permanent

The treatment of congestive failure is on routine lines — rest digitalis mercurials Sedatives and thiamine are often useful The dosage of thiouracil and propyl-thiouracil is described under appropriate heads

Subtotal thyroidectomy should only be considered in cases that do not respond to therapy with thiouracil or propyl-thiouracil

PULMONARY HEART

Cor pulmonale may be acute or chronic The acute variety is due to a large pulmonary embolus The symptoms are sudden in onset and consist of severe chest pain and dyspnea These are usually quickly followed by risks of shock Death very often occurs suddenly after a massive occlusion of one

of the main branches of the pulmonary artery, while after a less extensiv obstruction survival may be attended by signs of right sided cardiac failur

Treatment—Morphine ¼ grain is injected subcutaneously. Oxygen given either by the mask or in its absence the catheter. The patient is kej warm in bed and measures to combat shock adopted.

The chronic cor pulmonale may be due to a number of causes: emphysema asthma, tuberculosis of the lungs, pneumono-conioses and pulmonary enda teritis obliterans (Ayerza's disease) The symptoms are those of the underlyin pulmonary disease, dyspnea, cyanosis, hemoptysis, clubbing of the finge polycythemia, etc. The symptoms and signs that direct attention to the hear are venous engorgement, typical cardiac silhouette, accentuation of pulmonar second sound and at times a systolic murmur in the pulmonary area.

Treatment—Treatment is that of the causal condition and accompanyin heart failure.

ANEMIC HEART

When hemoglobin falls below 50 per cent, symptoms closely simulatin heart disease may appear. These are breathlessness, vertigo, palpitation weakness and at times anginal pain on exertion On physical examinatio there is enlargement of the heart and systolic murmur may be heard at th apex or base. In severe cases diastolic murmurs have been described. Treatment consists of that of the underlying anemia. When this is controlled al cardiac symptoms and signs may disappear. The size of the heart diminishes, the murmur disappears and the anginal pain is no longer experienced. Even in the presence of coronary disease, improvement in the blood picture may often raise the threshold to pain on exertion.

BERI-BERI HEART

Beri-beri heart has a special interest for physicians in this country being fairly frequently encountered among the rice eating populations.

Beri-beri may be classified into the following three types:

(a) Dry type in which symptoms of neuritis predominate
(b) Wet type (Cardiovascular) in which symptoms of cardiovascular disease predominate.
(c) Mixed type.

The onset is usually insidious with vague and general symptoms of fatigue, indigestion, mild grades of dyspnea, tachycardia and tenderness over the muscles Later symptoms pointing to involvement of nervous system may develope When neuritis predominates the condition is known as the "dry type" of beriberi. In contrast to this another patient may show a predominance of cardiovascular symptoms: dyspnea, marked cardiac enlargement with dilatation, and fluid in the serous cavities. This is the so-called wet type Some authorities consider that the wet form is more apt to develop in young adult males engaged in strenuous occupations where neuritis does not appear early and force

the patient to rest Gastro-intestinal disturbances such as nausea, vomiting or diarrhea may occur in both forms Nearly every physician occasionally comes across patients who show signs of congestive failure in the absence of valvular disease, hypertension or other obvious cause In all of these the nutritional history should be carefully investigated A watch should always be kept for associated symptoms · neuritis, gastro-intestinal symptoms, dermatitis of pellagra type If the diagnosis is correct the symptoms should improve after treatment with vitamin B_1.

There are several useful preparations of vitamin B_1 (thiamin) on the market, Betalin S (Lily), Beneva forte and Berin Fifty mg should be given by hypodermic injection for the first 10 days Thereafter thiamin may be given by mouth If congestive failure is present digitalis and other measures useful in congestive heart failure should be employed at the same time

The diet should be adequate in foods rich in vitamin B. If there is a multiple vitamin deficiency as occurs so often, a multi-vitamin preparation like [illegible]larite (Sharpe and Dhome) or vigran (Squibb's) or nestrovit should be given.

HYPOTENSION

The treatment of hypotension depends upon the cause The patient who has occasional giddiness due to faulty postural adjustment should assume horizontal position when abnormal sensations are experienced. This results in prompt and complete recovery For prophylaxis an elastic abdominal belt and stockings of the same material are beneficial During convalescence from acute infections and other prolonged illnesses, graded exercise and massage are of value The hypotension of shock will respond when measures are taken to restore the volume of blood In Addison's disease improvement accompanies the administration of the cortical hormone In orthostatic hypotension ephedrine by mouth in doses of ½ grain 3 times a day or amphetamine 1/6 grain 2 or 3 times a day is of value

THE HEART IN INFECTIOUS FEVERS

The effect of infectious fevers on the cardiovascular system may be dual, that on the myocardium and that on the peripheral circulation. In mild and short infections the effect may not be perceptible *In severe or prolonged* infections, tachycardia out of proportion to the fever, cyanosis, irregularities of rhythm, heart block, falling blood pressure, increasing venous pressure and diminution of the second pulmonary sound point to an involvement of the myocardium and a right sided heart failure The symptoms and signs that suggest peripheral circulatory failure are weakness, pallor, falling blood pressure, decreasing pulse pressure, tachycardia and faint heart sounds

Treatment—The only drugs that are of value are caffeine sodium benzoate, pholedrine and methedrine. Caffeine sodium benzoate is injected slowly in doses of 7½ grains in 20 c.c. of distilled water intravenously. Its action is both central, *i e*, on the medullary centres and directly on the cardiac muscle. The action of pholedrine (veritol) is in peripheral failure. The dose recommended is 1 to 2 c c intramuscularly or in emergencies half that dose by the vein

Methedrine acts in the same manner as pholedrine. Its action lasts much longer. Strychnine digitalin, epinephrine, ephedrine and posterior pituitary should not be used Digitalis and strophanthin should not be administered where signs of peripheral failure predominate. Even when frank heart failure occurs during the course of the infection, digitalis usually has little effect.

Camphor and camphor like substances such as cardiazol are of little value

In all acute infections preventive measures are of greater value than the drugs above described These are good nursing, proper rest, sleep, well balanced diet, adequate fluid intake, intravenous glucose and if cyanosis appears oxygen When excessive fluid has been lost 500 to 1,000 c c. of 5 per cent glucose in normal saline may be given Blood or plasma transfusions under these circumstances are of value. Great care should, however, be taken to prevent overloading of the circulation by injection intravenously of too large amounts of fluid When in doubt determination of venous pressure by the direct method or when available by the phlebomanometer, may be valuable.

THE HEART IN PREGNANCY

During pregnancy the work of the heart is increased This is due to the following factors gain in weight accompanying pregnancy, postural alterations, continued increase in the size of the uterus with its increasing vascularity, elevation of B M R, increase of circulating blood volume

An examination particularly after the 4th month reveals changes in the shape, size and position of the heart. A pulmonary systolic murmur may appear It is usually loudest in the recumbent position and may almost disappear in the erect posture. The pulmonic second sound may be accentuated. To confuse the picture further, palpitation dyspnea, and edema of the feet and legs—early signs of cardiac failure—may also occur in uncomplicated pregnancy.

The majority of women of child-bearing age who have heart disease (approximately 80 per cent) suffer from the rheumatic type with mitral stenosis Congenital defects are present in about 5 per cent, another 5 per cent suffer from hypotension The remaining 10 per cent are caused by syphilis, arteriosclerosis, etc

The questions that a physician may be asked are:

1 Should young persons suffering from heart disease get married?

2 After marriage is pregnancy advisable?

3 Having got pregnant what are the risks and how best they can be avoided?

1. Young persons who have had congestive heart failure, should be dissuaded from marrying. In those who have well compensated heart disease, it is as a rule unwise and unkind to forbid marriage but the additional risks and responsibilities should be explained to the contracting parties. The expectation of life in the affected partner is not normal. A woman suffering from heart disease is ineligible for life assurance. A woman may breakdown under the stress and strain of looking after a home and bearing children.

Young women who have or have had congestive failure should not get pregnant Those who get symptoms of breathlessness, etc, on ordinary exertion should not also become pregnant The remaining, and they form a large majority of women of child-bearing age with heart disease, can have one or at most two babies without serious detriment if the surroundings are reasonably good and skilled attention is available during the antenatal period

For assessing the risks of pregnancy and labour in women with heart disease it is customary to divide the patients into four groups:

Group I consists of patients who have heart disease but no symptoms With adequate attention during the antenatal period they go through pregnancy like most normal women

Group II consists of women with heart disease who develop cardiac symptoms after heavy exertion. They are also good risks They should, however, be kept under observation Treatment consists in provision of more rest and adequate sleep Such patients should avoid fatigue and live within the capacity of their cardiac reserves Usually this is all that is required.

Group III consists of those patients who develop breathlessness on mild exertion If such patients are seen during the first three months they should be advised that pregnancy be terminated, as by the time the sixth or the seventh months are reached, congestive heart failure of a more serious grade may be anticipated If, however, they are seen at midterm or later they should be kept in bed for a period of 3 to 4 weeks and digitalis administered An adequate sleep should be secured and the anemia corrected by a suitable preparation of iron

Group IV is composed of patients who have signs of heart failure at rest Treatment depends upon the time the patient is first seen If patient is seen during the first three months, an attempt to restore compensation is made by enforcing absolute rest and use of adequate doses of digitalis or mercurials Only when compensation is restored should the uterus be evacuated If labor starts spontaneously, morphine should be given hypodermically to postpone delivery until circulatory balance has been restored If the patient is seen later, attempts should be made to restore compensation by the usual methods · absolute rest in bed, digitalization, use of mercurials, suitable nursing and proper diet. In patients who have been suitably supervised a successful delivery may be anticipated They should be admitted to a hospital or a nursing home a fortnight before the expected time Adequate rest, long hours of sleep and digitalization should be attended to During labor a sedative is usually indicated such as morphine ¼ grain combined with hyoscine 1/150 grain. A light anesthesia may be allowed A protracted labor is to be avoided and timely use of forceps is frequently desirable to shorten the second stage.

Should labor start in the presence of congestive failure, it is wiser to allow it to proceed than to attempt the artificial evacuation of the uterus. With efficient treatment and a satisfactory response, it may be possible to perform a Cesarean, at which time with the permission of the husband and the patient she should also be sterilized.

FUNCTIONAL HEART DISEASE

Many patients have "heart disease" that does not exist The commonest symptoms are breathlessness, palpitation and pain over the region of the heart.

Management—Management of patient's suffering from neuro-circulatory asthenia is not easy The physician should make a complete examination of the cardiovascular system including flouroscopy and taking of electrocardiographic records The patient should then be told that he has no organic heart trouble

He should be prescribed an adequate diet. The bowels should be regulated and a proper sleep ensured The use of tea, coffee, alcohol and tobacco should be forbidden Strenuous exercise should be at first forbidden Light exercise should be allowed and gradually increased as tolerance improves

Septic foci in teeth, tonsils, sinuses should receive adequate attention Anemia if present is suitably corrected by iron Bromides or phenobarbital may be prescribed if sedatives are indicated Digitalis is useless and may aggravate trouble

CHAPTER XX

DISEASES OF BLOOD VESSELS

SYNCOPE

Syncope or fainting is due to a suddenly produced ischemia of the brain. It may be due to vasomotor instability (combined with emotion, fright or illness), anemia, prolonged standing, heart block, ventricular tachycardia or carotid sinus syndrome

Treatment—The head should be lowered, the legs elevated, the clothing loosened especially around the neck and water splashed on the face Aromatic spirit of ammonia or smelling salts should be held under the nose A mixture of 90 per cent oxygen and 10 per cent carbon dioxide for inhalation is useful in more serious attacks An intravenous injection of 1 c c of adrenalin chlor 1-1,000 may be needed For prevention of attacks the contributing cause or causes should be traced and treated An abdominal binder is of value Ephedrine hydrochloride in doses of 30 mg ($\frac{1}{2}$ grain) 3 times a day may be given When the fainting attacks are associated with an arrythmia, quinidine 3 grains should be given three times daily.

CAROTID SINUS SYNDROME

Fainting attacks or even convulsions are due to a hyper-active carotid sinus The stimulation of the sinus may be due to tight collars, or positions and movements in which the neck is twisted or pressed unnaturally

The treatment of attacks has been described under syncope For prevention the treatment depends upon the mechanism involved In cases associated with asystole or bradycardia, the drugs used are atropine, belladonna or syntropan. Belladonna may be given as tincture in doses of 10 to 15 minims three times a day. In patients with fall in blood pressure and no bradycardia, sympathetic stimulants should be given Ephedrine $\frac{1}{2}$ grain 3 times a day is useful. In a still different and rare type there is neither bradycardia nor hypotension The condition is due to an imperfectly understood mechanism in the brain itself. The treatment is unsatisfactory

SHOCK

The principal lesion in shock is a diminution in circulating blood volume. This may be due to a pooling of blood in the veins, passage of fluid into the tissues through paralysed capillaries or failure in the venous return due to muscle relaxation Among the several causes are hemorrhage, trauma, burns, infections and diabetic acidosis The treatment of shock has been tabulated by Freeman as follows ·

Shock

Cause	*Treatment*	*Cause,*	*Treatment*
Hemorrhage	Transfusion	Fear	Reassurance
Dehydration	Fluids	Asphyxia	Oxygen
Pain	Morphine	Exhaustion	Rest
Cold	Warmth		

The patient should be kept warm in bed. The foot of the bed is raised Morphine may be given if there is severe pain but should otherwise be omitted because of the risk of respiratory depression. *Fluids should be given intravenously.* If erythrocytes are also needed blood transfusion is ideal Otherwise blood serum or plasma should be used. Plasma and serum have the advantage of simply increasing the blood volume without addition of unnecessary erythrocytes Plasma has also the advantage that no typing is needed, it is a cheaper and it is available as a stable powder which may be kept until needed. The amount required is usually from 1 to 2 quarts.

When blood or plasma is not available 5 per cent dextrose or physiological salt solution may be employed. In the presence of acidosis 1 pint of 5 per cent sodium bicarbonate solution should be injected intravenously in addition. Recently one per cent solution of pectin, casein digests and ascitic fluid have been employed Their use is still in the experimental stage

Drugs are seldom indicated. Pholedrine or methedrine ½ to 1 c c. intramuscularly may be given and are useful. Desoxycorticosterone acetate (Percorten ciba, cortin, eucortone) in doses of 5 or 10 mg. daily by subcutaneous injection is valuable.

Oxygen inhalation in 100 per cent concentration is sometimes beneficial

THROMBOANGIITIS OBLITERANS

(Buerger's Disease)

It is an inflammatory disease of the arteries and veins, involving mostly the blood vessels of the lower extremities. Occasionally spermatic, cerebral, ocular, coronary, renal, pulmonary, facial or mesenteric blood vessels are involved. The cause is not known but tobacco, ergot poisoning and infection with ricketsia are among those suggested The disease is most common in young Jews but cases occur in all races and all climates Frequently a migratory phlebitis of the superficial veins is associated The circulation is often so impaired that pain, intermittent claudication and often gangrene occur.

During acute episodes the patient should be kept in bed and given a nourishing diet The involved extremity should be kept in a position that it is not blanched It should be well supported on pillows to avoid pressure areas A craddle should be used to prevent the weight of bed clothes If pain is severe codeine or morphine may be used. Papaverine hydrochlor. 40 mg (⅔ grain) given intravenously may relieve pain by relaxing spasm and dilating collaterals Use of tobacco should be completely forbidden.

In ambulatory patients the feet should be cared for as in diabetes Scrupulous attention should be paid to cleanliness and chafing prevented Minor operations should be avoided except by experts The nails should be carefully trimmed and adequate treatment prescribed for any existing epidermophytosis.

Passive Vascular Exercises—Buerger recommends raising of the leg till it blanches, than lowering it until its rubor becomes maximal and finally letting

it remain in a horizontal position for a few minutes The process is repeated during 15 to 30 minutes, 3 times a day. The same result may be obtained by alternately bathing the limb in hot water at 40 5°F and cold water at 10°C, 1 minute in each bath repeated 15 times, the whole procedure being carried out thrice daily. Mechanical boots in which the pressure is alternately raised and lowered are of use when available. Fuchs recommends syncardial massage

Drugs—The drugs of value in this condition are TEAC (Tetra-ethyl-ammonium chloride), histamine, acid phosphate, triethanolamine of niacin and tissue extracts like padutin, depropanex (Sharpe and Dhome) and cytochrome C Tetra-ethyl-ammonium chloride is injected intravenously and the dose is ½ to 5 c c The higher the blood pressure the smaller is the dose. Fisher (1949) prefers parenteral TEAC ganglionic block to paravertabral block by procain hydrochlor in the treatment of peripheral vascular disease

Mufson (1948) commends the use of histamine acid phosphate 1 38–2 75 mg in 500 c c. normal saline at the rate of 2 and 5 drops heart beat into the femoral artery Treatment was given weekly to begin with and later once a month

Bhoumil Prussik finds 3 per cent triethanolamine of niacin the most successful vasodilator in thromboangiitis obliterans, arteriosclerosis obliterans, diabetic obliterating endarteritis, acrocyanosis and Raynaud's disease Five c c are injected I V. on the first day, 10 c c on the second and 20 c c on the third and subsequent days if no untoward reactions occur The average course is 20 injections but as many as 40 may be needed

Messinger and Goodman (1949) state that sympathectomy gives results so impressive that it should be recommended for all patients with this disease

ARTERIOSCLEROSIS

The treatment is symptomatic and consists of rest, appropriate diet and regulation of the bowels An adequate sleep should be ensured Foci of infection if any should be eradicated Iodides have been given empirically for a long time Sodium iodide 2 to 3 grains or Lugol's iodine 10 drops three times a day are the usual preparations

Arteriosclerosis may give rise to arterial occlusion of an extremity The signs and symptoms of arteriosclerosis obliterans as it affects the extremities have been enumerated by Irving S Wright .

1 Atrophy of the skin and nails
2 Atrophy of muscles with marked loss in circumference
3 Pallor on elevation followed by cyanosis on dependency of the affected extremity.
4 Increase above ten seconds of the venous filling time
5 Lowered skin temperature.
6 Numbness, pins and needles
7. Tortuosity of the arteries where they are visible

The patient should be kept warm in bed. The foot of the bed is raised. Morphine may be given if there is severe pain but should otherwise be omitted because of the risk of respiratory depression. Fluids should be given intravenously. If erythrocytes are also needed blood transfusion is ideal Otherwise blood serum or plasma should be used. Plasma and serum have the advantage of simply increasing the blood volume without addition of unnecessary erythrocytes Plasma has also the advantage that no typing is needed, it is a cheaper and it is available as a stable powder which may be kept until needed. The amount required is usually from 1 to 2 quarts.

When blood or plasma is not available 5 per cent dextrose or physiological salt solution may be employed In the presence of acidosis 1 pint of 5 per cent sodium bicarbonate solution should be injected intravenously in addition Recently one per cent solution of pectin, casein digests and ascitic fluid have been employed. Their use is still in the experimental stage.

Drugs are seldom indicated. Pholedrine or methedrine ½ to 1 c c. intramuscularly may be given and are useful Desoxycorticosterone acetate (Percorten ciba, cortin, eucortone) in doses of 5 or 10 mg daily by subcutaneous injection is valuable.

Oxygen inhalation in 100 per cent concentration is sometimes beneficial.

THROMBOANGIITIS OBLITERANS

(Buerger's Disease)

It is an inflammatory disease of the arteries and veins, involving mostly the blood vessels of the lower extremities Occasionally spermatic, cerebral, ocular, coronary, renal, pulmonary, facial or mesenteric blood vessels are involved The cause is not known but tobacco, ergot poisoning and infection with ricketsia are among those suggested. The disease is most common in young Jews but cases occur in all races and all climates Frequently a migratory *phlebitis of the superficial veins is associated* *The circulation* is often so impaired that pain, intermittent claudication and often gangrene occur.

During acute episodes the patient should be kept in bed and given a nourishing diet The involved extremity should be kept in a position that it is not blanched It should be well supported on pillows to avoid pressure areas. A craddle should be used to prevent the weight of bed clothes If pain is severe codeine or morphine may be used. Papaverine hydrochlor. 40 mg (⅔ *grain) given intravenously may relieve pain* by relaxing spasm and dilating collaterals Use of tobacco should be completely forbidden.

In ambulatory patients the feet should be cared for as in diabetes Scrupulous attention should be paid to cleanliness and chafing prevented Minor operations should be avoided except by experts The nails should be carefully trimmed and adequate treatment prescribed for any existing epidermophytosis

Passive Vascular Exercises—Buerger recommends raising of the *leg* till it blanches, than lowering it until its rubor becomes maximal and finally letting

it remain in a horizontal position for a few minutes The process is repeated during 15 to 30 minutes, 3 times a day. The same result may be obtained by alternately bathing the limb in hot water at 40 5°F and cold water at 10°C, 1 minute in each bath repeated 15 times, the whole procedure being carried out thrice daily Mechanical boots in which the pressure is alternately raised and lowered are of use when available. Fuchs recommends syncardial massage

Drugs—The drugs of value in this condition are TEAC (Tetra-ethyl-ammonium chloride), histamine, acid phosphate, triethanolamine of niacin and tissue extracts like padutin, depropanex (Sharpe and Dhome) and cytochrome C Tetra-ethyl-ammonium chloride is injected intravenously and the dose is ½ to 5 c c. The higher the blood pressure the smaller is the dose Fisher (1949) prefers parenteral TEAC ganglionic block to paravertabral block by procain hydrochlor. in the treatment of peripheral vascular disease

Mufson (1948) commends the use of histamine acid phosphate 1 33–2 75 mg in 500 c c normal saline at the rate of 2 and 5 drops heart beat into the femoral artery Treatment was given weekly to begin with and later once a month

Bhoumil Prussik finds 3 per cent triethanolamine of niacin the most successful vasodilator in thromboangiitis obliterans, arteriosclerosis obliterans, diabetic obliterating endarteritis, acrocyanosis and Raynaud's disease Five c c are injected I V. on the first day, 10 c c on the second and 20 c c on the third and subsequent days if no untoward reactions occur The average course is 20 injections but as many as 40 may be needed

Messinger and Goodman (1949) state that sympathectomy gives results so impressive that it should be recommended for all patients with this disease

ARTERIOSCLEROSIS

The treatment is symptomatic and consists of rest, appropriate diet and regulation of the bowels An adequate sleep should be ensured Foci of infection if any should be eradicated Iodides have been given empirically for long time, Sodium iodide 2 to 3 grains or Lugol's iodine 10 drops three times day are the usual preparations

Arteriosclerosis may give rise to arterial occlusion of an extremity The signs and symptoms of arteriosclerosis obliterans as it affects the extremities have been enumerated by Irving S Wright.

1. Atrophy of the skin and nails
2. Atrophy of muscles with marked loss in circumference
3. Pallor on elevation followed by cyanosis on dependency of the affected extremity
4. Increase above ten seconds of the venous filling time
5. Lowered skin temperature
6. Numbness, pins and needles.
7. Tortuosity of the arteries where they are visible

Warm gloves and socks should be worn The patient should be kept as physically active as possible The mental strain should be reduced to a minimum. Thyroid gland should be given if the B. M. R. is low A high vitamin regime is recommended. Mecholyl iontophoresis as described earlier is of value. Vasodilating drugs such as papaverine, depropanex and vasodilator compound may be used Ganglionectomy has been recommended by White.

THROMBOPHLEBITIS

From the clinical standpoint thrombophlebitis may be divided into four groups:

I. Local Thrombophlebitis due to chemical, mechanical, infectious or suppurative trauma. A primary lesion of the wall or intima of the vein is essential factor. Chemical thrombophlebitis may be induced by intravenous injection of drugs like arsenicals, mercurial diuretics, hypertonic solutions of saline and glucose This principal is exploited in the treatment of varicose veins by intravenous injections of sodium morrhuate, sodium ricinoleate, quinine and urethane Mechanical thrombophlebitis occurs following gross mechanical injury as in the so-called axillary thrombophlebitis

Local Infectious thrombophlebitis may occur in association with erythema nodosum, tuberculosis and tuberculids, gummas and inflammatory processes of known and unknown etiology Suppurative thrombophlebitis is due to association with suppurative condition. Suppurative mastoiditis may give rise to suppurative thrombophlebitis of the juglar vein Intra-abdominal infections may give rise to portal thrombophlebitis and occasionally thrombophlebitis of the iliac vein or its branches. Spontaneous thrombophlebitis may occur in association with varicose veins.

II. *Hematogenic Thrombophlebitis*—Thrombophlebitis occurs in association with blood dyscrasias such as chlorosis, polycythemia vera, leukemias and pernicious anemia

III. *Secondary Thrombophlebitis*—It occurs post-operatively, after delivery, as a late complication of severe injuries and in infectious diseases such as typhoid, pneumonia, influenza, acute tonsillitis, acute appendicitis, pyelonephritis, pelvic inflammations, undulant fever, exanthems, etc It may also occur in association with non-infectious systemic diseases like carcinoma, heart disease, exophthalmic goitre, diabetes mellitus, gout, brain tumour and ureteral lithiasis

IV. Primary Thrombophlebitis occurs in thromboangitis obliterans, and recurring (thrombophlebitis migrans) and non-recurring idiopathic thrombophlebitis.

Common symptoms are pain and tenderness, swelling with or without edema, fever, tachycardia, malaise and in suppurative form chills. As acute phase passes persistent symptoms due to residual venous insufficiency and congestion result.

When superficial veins are involved red, painful, tender, moderately raised regions may be found in the skin. They are usually firm, cord like segments in the course of a vein.

Treatment—Mild superficial thrombosis requires little treatment other than rest of the affected part. If there is pain and temperature, rest, elevation, chemotherapy (sulfonamides or penicillin), analgesics and application of warm wet dressings will afford relief.

There is considerable controversy with regard to rest *versus* exercise in the treatment of thrombophlebitis. Should absolute rest be given to the affected part or moderate or vigorous exercise advised? During the acute stage the patient will have little inclination to move the limb because of pain, and will be more comfortable with the leg elevated and warm wet dressings in place Exercise is thought to hasten the formation of collateral blood-vessels and 72 hours after the onset is not likely to dislodge a thrombus because the process of organization with the vessel wall has already begun. While the patient is in bed moderate exercise with the affected part elevated is probably advisable after the third or fourth day, but vigorous movement will probably be not tolerated by the patient himself

As there is a possibility of pulmonary embolism occurring in cases of thrombosis of deep veins of the legs, its prevention by ligation of the femoral or iliac veins or by use of anti-coagulants must be considered Hines believes that anti-coagulant therapy is more efficient than ligation.

Treatment is started with intravenous injections of heparin 50 mg 4 hourly and after 2 days dicumarol by mouth is substituted The dose of dicumarol is 300 mg on the first day and 200 mg daily If the prothrombin time falls below 30 per cent of the normal the daily dose is omitted

ARTERIAL EMBOLISM

Arterial emboli in the extremities or elsewhere are derived from the auricles of the heart or from vegetations detached from the cardiac valves Pulmonary emboli are the result of phlebitis

In embolism of the extremities an attempt should be made to dislodge the embolus and force it down into a smaller vessel where its effects are not so serious. This is accomplished by raising the head, lowering the extremities, applying warmth from electric lamps (use a baker) and intravenous injection of ½ grain papaverine combined with atropine 1/100 grain The use of a passive vascular exercise apparatus may occasionally prove useful in dislodging the embolus. Heparin has been suggested in doses of 1½ to 2 grains as a 5 per cent solution intravenously. More recently dicoumarin has been given by mouth with success. The suggested dose is 5 mg per kilogram initially followed by 1 5 mg. per kilogram daily thereafter

Surgery—Embolectomy should not be delayed too long if other measures fail, as otherwise secondary thrombosis may make amputation necessary.

PULMONARY EMBOLISM

The patient should be propped up in bed if this makes breathing easier An oxygen tent is useful. Papaverine ½ grain combined *with atropine* 1/100 grain should be given intravenously. Embolectomy should be performed immediately

if skilled surgical aid is available. Heparin and dicoumarine have been suggested. The dosage and method of administration have been described under arterial embolism.

AIR EMBOLISM

It may follow such procedures as artificial pneumothorax It is treated by immediate cessation of the injection, by lowering the patient's head, by hypodermic injection of epinephrine (1 c c. of 1,000 solution) and caffeine and sodium benzoate 7½ grains If respiration fails artificial respiration is indicated.

MILROY'S DISEASE

(Familial Hereditary Edema)

In this condition massive edema particularly of the lower extremities occurs, due to congenitally defective lymphatics Bed rest with elevation of the limb or the foot of the bed causes disappearance of the edema. Following this, recurrence should be prevented by use of elastic bandages when the patient is out of bed. Some patients are easily controlled by intramuscular injections of esidrone once or twice a week.

CHAPTER XXI

DISEASES OF THE RESPIRATORY SYSTEM

COMMON COLD

Treatment may be described under two heads (*a*) abortive, (*b*) that of the established condition

(*a*) *Abortive Measures*—A hot bath followed by a hot drink of black current juice sweetened with sugar and with a table spoon of brandy added is often grateful Five grains of aspirin combined with 5 grains of Dover's powder at bed time will secure a good night's rest. Other traditional valued remedies are tea-spoon of the ammoniated tincture of quinine or 5 minims of ol cinnamon in hot milk.

Local measures of value are the use of decongestents like endrine, ephedrine compound inhalant (Lily) and amphetamine. A useful formula is

℞ Ephedrine hydrochloride	gr 1
Glucose	gr. 18.
Normal saline	fl oz. I.

Another commonly used formula is made as follows

℞ Ephedrine hydrochlor	gr 4.
Menthol	gr. 4
Camphor	gr 4
Oil of thyme	m 10.
Paraffin liquid	fl oz 1

(*b*) *Treatment of Established Attacks*—If the patient has reached the acute stage with profuse rhinorrhea, he should stay in-doors in a well ventilated warm room for 24 to 48 hours. No laxative is indicated if bowels have been freely moving; if constipation has been present for a day or two preceding, the patient's habitual laxative may be given The diet should be one easily digested, used in fevers Fluids (water, tea) should be taken freely.

The only drugs required are aspirin 10 grains t.i d. and a dose of Dover's powder (5 to 10 grains) at bed time If the secretion from the nose is tenacious, ammonium chloride may be a drug of value

℞ Ammon. Chlorid.	gr. 90.
Syrup Acid Citric	m 80
Aq. ad.	fl oz. 4.

Sig.—A tea-spoon in water three times a day. If a cold becomes subacute and prolonged, a small dose of iron with or without strychnine is advisable.

Sulphonamides should not be given in uncomplicated coryza.

The most suitable form of local treatment consists of inhalations of steam impregnated with Friar's balsam, menthol or eucalyptus Inhalations may be taken from an ordinary jug surrounded by a towel at the upper end; the eyes should be kept out of the funnel formed by the towel. When sinusitis is present a decongestent preparation should be sprayed into the nose before using the inhalation.

ACUTE BRONCHITIS

Rest in bed for one or two days should be insisted upon. In the non-productive stage, a few drops of syrup Ipecac or ½—1 gram of pulv. Ipecac every 2 hours is one of the best promoters of a free secretion. Ipecac should never be pushed to the point of causing nausea In the second stage when free secretion is established no expectorant works so well as ammonium chloride. The dose is 4 grains every 2 hours.

℞ Ammon. Chlorid.	gr. 32
Syrup Acid Citric.	fl oz. 1.
Aquae ad.	fl. oz. 4

Sig.—Eighth part in water every 2 hours.

If a sweeter mixture is desired syrup tolu or syrup pruni. virg. may be used in place of syrup acid citric.

If the cough is excessive and more than the secretion calls for, a small dose of codeine sulphate may be given in addition as in:

℞ Codeine Sulphat	gr. 1.
Ammon. Chlorid.	gr. 32.
Syrup Pruni. Virg.	fl. oz. 1.
Aquae ad.	fl. oz. 4.

Sig.—Eighth part in water every 2 or 3 hours

If the larynx is inflamed, steam impregnated with tincture benzoin co. (m. 30 to a pint) or oil of eucalyptus m. 5 to a pint should be inhaled.

If expectoration becomes profuse and does not stop readily terpin hydrate 5 grains, four times a day is of value. *If cough persists* for more than a week, the sputum should be examined If it proves to be simple bronchitis but prolonged, sodium iodide in small doses may be beneficial especially if the patient is at all asthmatic or if he is an elderly person.

CHRONIC BRONCHITIS

The treatment may be described under three heads. 1. elimination of the etiologic factor, 2. general measures, 3. expectorants.

1. *Eradication of Etiological Factor*—Obesity, cardiovascular disease, abnormalities of nose and throat, unsuitable climate and work in a dusty atmosphere, all need suitable consideration.

2. *General Measures*—Diet should contain abundance of butter, cream, milk, etc., in debilitated persons; in over-weight persons weight *reducing* measures

are helpful A tepid or warm bath should be followed by vigorous friction with a rough towel Breathing exercises are recommended Excessively heavy and thick clothes should be avoided Footwear should be warm Fogs and damp weather are harmful; if possible, patient should winter in a warm dry climate Smoking should be given up or curtailed, inhalation of cigarette smoke is particularly harmful. Vaccines either stock or autogenous are beneficial in some cases.

3 *Expectorants*—Choice of drug depends upon character of sputum and associated symptoms such as pain, dyspnea and bronchial spasm When the cough is irritating and spit tenacious, alkalies, potassium iodide and ammonium chloride are of use When the secretion is profuse, stimulating expectorants like ammon. carb and tincture of squills are of value If bronchial spasm is present anti spasmodics such as tincture strammonium m 10 or tincture lobelia m. 10 or ephedrine hydrochloride gr. ½ should be added. For irritating, non-productive cough, tincture camphor co or syrup codeine or linctus diamorphine et scillæ are recommended Cosylan (P D & Co) is a useful sedative

Following additional formulæ are of value:

℞ Pot Iod	..	gr	5
Ammon Chlor	.	gr	10
Syrup. Tolu	.	fl dr	1
Aq ad.	.	fl. oz	1

Sig—When expectoration is viscid and cough irritating

℞ Ammon Carb	..	gr	5
Tinct. Scillæ	...	m	10
Spt. Chloroform	...	m	10
Syrup Tolu	...	fl dr	1
Aq ad	.	fl oz	1

Sig—When secretion is profuse

℞ Pot Iod.	..	gr	5
Tinct. Bellad		m	3
Tinct. Strammon	.	m	5
Ext. Glyc Liq.	.	m	15
Aq ad	..	fl. oz	1

Sig—Anti-spasmodic cough mixture

℞ Syrup Codeine Phosphos . fl dr i-ii

Sig—Sedative cough linctus

The use of penicillin aerosol has recently been recommended.

Bronchiectasis

Treatment may be described under five heads

1 *Improvement of General Health*—The principal measures are good food, suitable clothing and exercise, tonics like cod liver oil in winter and iron to correct the anemia

2 *Eradication of Septic Foci*—Septic foci in the upper respiratory passages should be eradicated

3 *Postural Drainage*—Postural drainage should be resorted to for 15 minutes before meals, two or three times in a day. If the secretion is thick and drainage poor, bronchoscopic aspiration should be performed

4 *Drugs*—An expectorant mixture should be followed by a hot drink In acute exacerbation sulfonamides by mouth or a course of penicillin are of value. *Penicillin aerosol obviates the use of frequent injections* Streptomycin should be given when resistance to penicillin is encountered A combination of aerosol penicillin and streptomycin is sometimes preferable.

If the sputum is offensive creosote in capsules m 3, t i d, may be given

5 *Lobectomy*—This should be considered in young subjects with unilateral disease.

Pneumonia

1 *General Measures*—These are complete rest in bed; a well ventilated room, a suitable diet consisting of milk, eggs, fruit juices, soups, plenty of water and glucose, care of the bowels which should move once daily; oral and skin hygiene

2 *Sulfonamides*—A fifty-fifty mixture of sulfadiazine and sulfamerazine should be employed In severe cases parenteral therapy may be combined with the oral use of the drugs Alkalies should be given freely and the fluid intake must be adequate In very toxic cases penicillin and sulfonamides should be combined

3 *Antibiotics*—In pneumococcal pneumonia the drug of choice is penicillin The dose recommended is 100,000 units 6 hourly of crystalline penicillin G or 300,000 units 12 hourly of procaine penicillin Terramycin is equally effective in doses of 0 5 Gm orally every 6 hours. Streptococcal pneumonias yield to therapy by penicillin Staphylococcal pneumonias are best treated by penicillin or aureomycin Pneumonias due to H. influenzæ and Friedlander's *bacillus* should be treated by streptomycin or preferably aureomycin The drug of choice in the treatment of virus pneumonia is aureomycin Chloromycetin, areomycin and terramycin are all effective against most kinds of pneumonia At the time of this writing (1952) terramycin is regarded as superior to other antibiotics in the treatment of pneumonia. If the bacterial cause of a pneumonia is therefore not known or the condition does not respond *within* 24 hours to therapy by penicillin, treatment with terramycin should be commenced

4 *Treatment of Symptoms*

Toxemia—Sponging, ice cap, plenty of fluids and glucose intravenously and by mouth

Sleeplessness—Morphine gr 1/6 during the first few days, later barbiturates such as phenobarbitone grs 1½ to 2

Pain—Strapping, short wave or codeine gr. ½ to 1.

Cough—Codeine gr ¼ to ½.

Cyanosis—Oxygen by the nasal catheter or face mask

Delayed Resolution—Short wave diathermy.

ATELECTASIS AND COLLAPSE

The treatment of the primary condition is important Prophylactic treatment consists in avoidance of the supine position and observing precautions against accumulation of the mucus in the respiratory passages In established cases with respiratory embarrassment 7 per cent Co_2 with oxygen should be administered at frequent intervals Bronchoscopic aspiration is valuable

Administration of ipecac or squills should also be considered When mucus is tenacious, pot iod is valuable

PULMONARY EDEMA

Treatment consists in the hypodermic injections of 1/6 to 1/4 grain of morphine combined with atropine. In suitable cases venesection may be considered Adrenalin 0 5 c c has been used with success The acute form may be treated with plus pressure machine When this is not available pure oxygen should be given by a mask or catheter

ABSCESS AND GANGRENE LUNG

General Treatment—Rest in bed, good nursing and an easily assimilable diet are important.

Penicillin—Penicillin is a valuable drug and should be given in doses of 20,000 O U every 3 hours intramuscularly The doses should be given day and night. When it is not easy to give injections, the use of penicillin aerosol is advisable and well worth a trial Streptomycine should be employed for Friedlander and colon bacillus infections

Arsenic—Arsenic is of value (neoarsphenamine intravenously) if suppuration is due to spirocheates

Emetine—Emetine is useful in amebic abscess of the lung

Postural Drainage—Should the abscess rupture into a bronchus, postural drainage should be instituted Postural drainage beds by Nelson and Singer obviate frequently moving of patient in bed and are valuable

Bronchoscopy—Bronchoscopy is indicated in the presence of a foreign body or when poor drainage is due to obstruction caused by granulation tissue, swollen mucosa or inspissated pus.

Surgery—Operative treatment consists of two stage operation

SYPHILIS OF THE LUNG

Treatment consists in the administration of potassium iodide by mouth and either bismuth and arsenic injections or a course of penicillin treatment

MONILIASIS

Cases are met with in South India, Ceylon and the Malay States Diagnosis may be confused with pulmonary tuberculosis Pot iod is of some value.

General health should be improved, otherwise treatment is that of chronic *bronchitis*

FIBROSIS LUNG

Prevention of bronchopneumonia during measles or whooping cough by use of sulfonamides, treatment of unresolved pneumonia by short-wave therapy and autogenous vaccines, adequate treatment of chronic bronchitis, tuberculosis, pneumokoniosis and pleural conditions are important in prevention.

When the condition is established, treatment consists of measures calculated to improve general health such as fresh air, change of climate, nourishing diet, cod liver oil, etc

PLEURISY

Dry Pleurisy

Local Measures—These consist of local applications of tincture of iodine on the affected side once daily or on alternate days When pain is severe strapping with adhesive plaster is useful.

General Measures—Rest in bed, fresh air and nutritious diet are important Aspirin 10 grains t i d. is useful for relief of pain. If there is cough codeine ¼ to ½ grain t.i d may be given

Cod liver or vitamin concentrates like esdavite (S & D), vigran (Squibbs) or Wyamin should be given and continued for a long time

Pleurisy with Effusion

Complete rest in bed, fresh air, nutritious easily digestible diet, vitamin concentrates, calcium and cod liver oil as in pulmonary tuberculosis are useful Rest in bed should be enforced until all fluid has absorbed and for 6-8 weeks thereafter. X-ray examination should be made every 2 months for a period of 2 years

Aspirations—Moderate effusions are best left alone When they are large and embarrassing respiration or heart, they should be aspirated If X-ray shows underlying pulmonary involvement, aspirated fluid should be replaced by air with a view to continue pneumothorax as a therapeutic procedure Paracentesis is best done by Dieulafoy's syringe or Potain's aspirator. The point of puncture (eighth space in the posterior axillary line) should be anesthetized with a 2 per cent solution of novocaine down to the pleura Not more than one pint should be removed It should be stopped if coughing is troublesome or pain supervenes Every time a tap is made penicillin 100,000 units in saline should be left in the pleural sac

EMPYEMA

An exploratory puncture should be made to ascertain the character of the pus which should be examined bacteriologically An X-ray examination of the chest should also be done at the same time.

Penicillin—The treatment of empyema has been revolutionized by the [illegible] drug is used both intramuscularly and intrapleurally [illegible] c.c. of normal [illegible] pleural cavity. From 2 to 3 treatments are usually necessary.

In refractory cases surgical treatment and penicillin may have to be combined.

CHAPTER XXII

ALLERGIC DISEASES

Asthma

Treatment of Attacks—The number of remedies used for treatment of asthma is *ad galore* Among the more important remedies may be mentioned ephedrine, epinephrine, isopropylepinephrine, aminophylline, phenobarbitone, oxygen, sulphathiazole, penicillin, antistine, pyribenzamine, benadryl, ACTH, cortisone and nitrogen mustards

Ephedrine—Mild attacks yield to ephedrine in ½ gr. doses The dose may be repeated in 6 to 8 hours' time. As tolerance is gradually established after a few days' use of the drug and it becomes relatively inefficacious, it is wise to stop it for a day or two and then resume its use In some patients ephedrine induces tremor, palpitation and insomnia. In these it should be combined with ½ gr of luminal or 1 gr of sodium amytal.

Adrenaline—The action of adrenaline in overcoming attacks in a majority of patients is instantaneous. Its action is perhaps also short-lived The drug may be used as an inhalant (adrenaline inhalant P. D & Co 1-100) or by a hypodermic injection When the watery solution is used a small dose of adrenaline (3 to 5 minims) should be injected subcutaneously. The dose must be small and the drug should not be repeated if 2 or 3 doses of 5 minims at half hourly intervals fail to bring relief. Persistence with adrenalin in such cases and particularly larger and larger doses of adrenaline is fraught with danger. For prolonged action slow acting adrenaline (adrenaline in oil) is put on the market

Isopropyl Epinephrin—A 1 in 200 solution used in hand nebulisers gives rise to broncho-dilatation and increase in expectoration The drug is useful in epinephrin fast patients in status asthmaticus

Aminophylline—In refractory cases aminophylline 7½ grains in 20 c c of a 50 per cent sterile dextrose solution intravenously should be tried and often brings relief Injections are given once daily. The treatment may be combined with administration by mouth of a sedative such as phenobarbitone (gr 1-1½) and oxygen by face mask or tent.

ACTH and Cortisone—Status asthmaticus often responds favourably to a dose of 10 mgm ACTH intramuscularly every 6 hours. Cortisone may be tried in doses of 25-50 mgm orally every 6 hours.

Nitrogen Mustards—Six patients, four of whom had status asthmaticus resistant to all therapy responded to HN_1. One obtained complete and permanent relief, others showed significant benefit.

Intravenous Procaine—A 0 1 per cent procaine solution given slowly intravenously often relieves the acute attack of bronchial asthma.

Ether—Cases of status asthmaticus which do not respond to other measures often do so to rectal administration of ether. Two ounces of ether are mixed with 4 ozs of olive oil and injected by a rectal catheter. In stubborn cases the method should be repeated once or twice.

If all measures fail, and the asthma continues severe, full ether anesthesia for about 30 minutes by the drop method may be life saving, and will usually favourably terminate the attack.

Sulfathiazole—The drug has been known to bring under control attacks of asthma in which the element of infection is predominant

Penicillin—In cases of asthma associated with infection beneficial results have recently been reported by use of aerosol penicillin. The treatment, however, needs further trial.

Ethylene Disulfonate—The drug has recently been used parenterally in the treatment of asthma A number of encouraging reports have been published but further confirmation is needed

Benadryl—Numerous encouraging reports have recently been published on the treatment of bronchial asthma and other allergic disorders by benadryl. The drug is of value in cases associated with hay fever In asthma unassociated with hay fever benefit is obtained in about 40 per cent of the cases If the drug gives rise to drowsiness it should be combined with ½ grain ephedrine. The recommended dose is 50-100 mg. t i d. In most cases, relief is obtained only while the drug is being used

Antistin—Antistin is marketed by Ciba both as tablets and ampoules One tablet is given 3 or 4 times a day In severe cases treatment is commenced by injections and continued with tablets.

Pyribenzamine—This is a similar drug to antistin

Syrup of Ipecac—Ratner (1942) recommends the use of syrup of Ipecac (½ to 1 teaspoon to infants and children and if this does not act 2 teaspoons), if epinephrin is not giving the expected relief Ipecac will cause forceful vomiting with release of the plugs. In adults the dose is repeated until the desired result is obtained. The syrup of Ipecac is followed by drinks of warm water.

Helium-Oxygen—Inhalation of 80 per cent helium and 20 per cent oxygen has been recommended by Barack with excellent results

Niacin—Nicotinic acid amide has recently been used as an adjuvant when other drugs fail. It is given intravenously in doses of 50 to 100 mg two or three times a day. In some cases it works well when given orally.

Treatment between Attacks—A painstaking history and a complete psychological and physical examination of the patient must be undertaken to ascertain the cause

Psychological Factor—The psychological factor in asthma is of great importance The typical asthmatic is a highly strung, over anxious, emotional and intelligent person whose broncho-constrictor center in the medulla is in a peculiarly irritable state, being easily influenced by many types of stimuli. It has been suggested that asthma may have a symbolic value, the paroxysm

representing in some way the underlying conflict or that the attack is the equivalent of a suppressed cry for sympathy. It may be the result of a conditioned reflex or the means to avoid a difficulty or gain an end The most important function of the psychological factor in asthma is to render the organism more sensitive to the physical factors which produce the attack Hurst considers expectation as the commonest psychological exciting cause in asthma Annoyance, anxiety or excitement may bring on an attack

The use of explanation and persuasion by the family physician and in more difficult cases reference to a psychologist can play an important part in relieving the mental conflict or the anxiety state

Allergic Factor—The earlier in life asthma appears, the more likely will an allergic factor be found. The probability is enhanced by the co-existence of urticaria, eczema, prurigo, hay fever, migraine or a family history of allergy. The allergen is usually a protein, although occasionally it may be a drug, *e g*, aspirin Ingestants (foods like milk, eggs, wheat, etc), are more important in infancy ; inhalants (house dust, pollens, horse dander, feathers, orris root, etc), in children and young adults Sensitiveness may exist toward more than one article.

In addition to a careful history it will be necessary to make certain tests (intradermal and scratch) for ascertaining sensitivity. These tests must always be thorough and never slipshod

When an individual is found to be sensitive to a particular food or inhalant contact with the offending article should be avoided If it happens to be an article which it is not possible to avoid desensitization must be attempted The value of intradermal tests and the benefit afforded by specific desensitization is very limited

Non-specific desensitization has also been recommended and many substances used for this purpose. peptone, tuberculin, milk, T. A. B. vaccine, sulphur in oil, autohemotherapy and gold The last two are at present in vogue Good results by use of gold have recently been reported by many observers

Infective Factor—Infections and abnormalities of the upper respiratory tract such as sinusitis, naso-pharyngitis, polypus, deflected septum, and infected tonsils should be adequately dealt with Local use of decongestent sprays, local application of the cautery, zinc ionization, puncture and lavage of the sinuses, removal of infected tonsils should all receive due consideration Vaccine therapy is worth a trial in cases followed by respiratory infections or in those who have a purulent sputum or show evidence of lung damage The vaccine employed may be a stock or autogenous catarrhal vaccine.

Drugs—An antispasmodic mixture containing potassium iodide to liquefy the sputum is often of value, *if continued for several months:*

R	Pot. Iod.	gr. 5
	Tinc. Strammon	m. 10
	Ext. Glycy. Liq.	m. 30
	Aq. ad.	fl. oz. 1

Ephedrine either alone or combined with a sedative may be taken if and when necessary Useful formulæ are :

℞ Ephedrine	...	.. gr. ½
Aminophylline	...	.. gr. 1½
Phenobarbitone	..	.. gr ½
or ℞ Ephedrine Hydrochlor	...	.. gr ½
Amytal	...	.. gr ¾

Sig—One capsule once or twice a day or as required

A few instances of amazing cures are reported in this disease A patient who suffered from obstinate asthma for years and was also seen by the author, got completely cured by the use of a proprietary remedy called mendaco The author tried this remedy on a number of other patients but without success in any A drug that succeeds in one case may prove completely worthless in the succeeding case.

Inhalations—If the airways are obstructed the nose may be sprayed with endrine or ephedrine compound inhalant (Lilly) or a similar formula made to order

℞ Ephed Hydrochlor	..	.. gr 4½
Cocaine Hydrochlor	...	gr 4½
Glucose	..	gr 18
Normal Saline ad	...	fl oz 1

Other Measures—These are change of climate, spa treatment and physical exercises for asthma No one climate suits all asthmatics Some do well on the mountains, others on the sea and still others in hot dry climates The benefit which occurs from stay at a spa is not due to its waters, it is probably the result of change and of the unconscious psychotherapy on the part of the spa physician

Physical exercises for asthma are described in the section on physical therapy For a detailed description the reader is referred to a book published by the Asthma Research Council entitled "Physical Exercises for Asthma" The book is priced 1s and is obtainable from Secretary, King's College Strand, London, W C. 2

Hay Fever

Contrary to the commonly held view, the disease is widely prevalent in this country. The spring type is due to the pollens of various trees, the autumn type is due to the pollens of grasses and ragweeds.

Exposed to the pollens to which they are sensitive patients develop symptoms immediately on inhalation of the pollen or in some a few hours later Sneezing, congestion of the nostrils, reddening and itching of the eyelids or of the inner canthi of the eyes, irritation of the roof of the mouth and throat and even spasmodic attacks of sneezing are the primary symptoms Later rhinitis may occur, with conjunctivitis, pharyngitis and bronchitis If the symptoms

continue long, the patients feel weak and depressed. In some a "hay fever asthma" develops

General Treatment—The patient should avoid atmosphere heavily laden with pollen Predisposing causes such as hypertrophic and sensitive mucous membrane of the turbinates, an obstructive and deflected septum and infected sinuses should be corrected Infected areas in the nose and throat should be treated The associated bronchitis should be treated The diet should be nutritious Mustard, condiments, tea and coffee, fish, strawberries and other foods likely to cause anaphylaxis must be avoided The bowels should be carefully regulated Calcium gluconate 15 grains t.i.d before the hay fever season is often of value.

Anti-histamine Compounds—The compounds used include benadryl, antistin, histantin, anthisan, phenergan, thephorin, diatrin, ambodryl and several others The usual dose is about 50 mg once or twice daily Results obtained in the symptomatic treatment of hay fever with these agents justify their continued use in treatment of this and other allergic disorders

Ephedrine, neo-synephrine and propadrine have been discussed under asthma and elsewhere

ACTH, Cortisone and Pyromen—The use of ACTH and cortisone in allergic disorders has already been considered Pyromen is another agent acting through the same mechanism as ACTH or cortisone. The initial dose is 1 or 2 mg pyromen in saline given intravenously. A second dose, usually 48 hours after the first and about 50 per cent greater if the initial response is not satisfactory, may produce an effect lasting 48 to 72 hours Thereafter doses are given at intervals of days or weeks as necessary As time goes on an attempt is made to lower dosage and oral medication is substituted. Though not as effective as ACTH or cortisone, it is a valuable agent in the treatment of chronic allergic disorders

Symptomatic Treatment—If patients cannot afford the luxury of a long sea voyage or move to some pollen-free atmosphere or live in air conditioned rooms, they should remain in-doors with windows closed and wear special pollen filters

Relief is obtained by use of nasal sprays containing adrenaline or ephedrine combined with novocaine and by oral use night and morning of a powder containing.

R Ephed Hydrochlor.
Phenobarbitone āā gr ½

Conjunctivitis is sometimes very distressing and requires the use of frequent boric washes

Specific Treatment—Suitable pollen extracts for pre-seasonal disensitization may be obtained from Parke Davis & Co, or Bencard. Some patients may need only one course of injections; the majority will require desensitization

during successive years Treatment should be commenced at least 10 weeks before the commencement of the season. Injections are given subcutaneously at intervals of 4 to 7 days The initial dose is 5 units It is gradually increased until a maximum of 100,000 units is reached before the onset of hay fever season This dose is repeated weekly for 3 to 4 weeks To each injection 2 minims of adrenaline (1 in 1,000) should be added to lessen the risk of a general reaction. If a general reaction occurs adrenaline ½ c c. should be injected and followed in ½ an hour by another ½ c c. if the reaction does not abate

Histamine Azoprotein—This is marketed as Lertigon by P. D. & Co. Its use has been discussed earlier in the section on Recent Progress

Zinc Ionization—The nose is sprayed with a solution of equal parts of amethocaine 2 per cent and adrenaline. Both sides are packed with ribbon gauze saturated with 1 per cent solution of zinc sulphate The positive electrode is then inserted while the patient grasps the negative pole A current of 7 to 10 ma is then passed for 15 minutes The procedure is repeated 3 to 4 times at intervals of 10 to 14 days, depending on the reaction inside the nose Reactions both during and after the treatments are often quite severe and convincing evidence of the efficacy of this kind of treatment has not been produced

Cauterization—Many cases can temporarily be relieved by cauterization of the inferior turbinates, using either a saturated solution of trichloracetic acid or chromic acid (40 per cent) or a fused bead of silver nitrate Electrocautery heated to a cherry red heat is also effective. Before using any type of cautery the nose should be anesthetized properly. No operation, however trivial, should be undertaken until the allergic symptoms have been brought under control.

ALLERGIC RHINITIS

Allergic rhinitis differs from hay fever in that it is not seasonal, is not caused by pollen and itching of the eyes is rarely present—an important differentiating point from hay fever The exciting causes are the same as those which initiate attacks of bronchial asthma, with one notable exception *i e*, pollen, as rhinitis due to pollen is called hay fever Allergic rhinitis can, therefore, be caused by inhalation of such substances as molds, feathers, house dust, orris root and animal derivatives or may be due to the ingestion of foods. Complications are frequent and important Bronchial asthma may be associated and/or may follow in later years

The treatment of allergic rhinitis except for local therapy is similar to that of bronchial asthma. The best results as in asthma come from specific treatment, *i.e*, the discovery and elimination of the exciting allergens, and hyposensitization in these cases in which complete elimination is not possible Since house dust, feathers, and orris root are the most common causes, therapy against these is indicated in all cases, even in instances in which the skin tests are negative.

Non-specific measures may also be necessary as they are in asthma, psychogenic, menstrual, infections and occupational factors must be combated

Locally many palliative measures exist Ephedrine, benzedrine, neosynephrin, propadrine antistin, benadryl, and other preparations all have their advocates

Nasal operations, cauterization, and ionization may also help for some time, but symptoms almost always return and the patient is frequently worse than before.

Vaccines, stock or autogenous are often useful.

ALLERGIC BRONCHITIS

It is characterized by attacks of cough without asthma. It occurs chiefly in children of allergic parents and is probably a fore-runner of true asthma A little wheezing and expectoration may or may not be present with spasmodic cough. Ephedrin or epinephrin usually gives relief, and complete skin tests should be done at once to prevent the onset of asthma The appearance in a child of repeated attacks of spasmodic cough, without organic basis, should always suggest the presence of allergy

EOSINOPHIL LUNG

It is a very common disease but our knowledge of it is only very recent The commonest symptom is a cough with an associated spasm and shortness of the breath The peculiarity of the cough is that it yields to none of the customary remedies As fever and loss of weight are also present a wrong diagnosis of pulmonary tuberculosis is often made The X-ray picture is ofteu also misinterpreted and helps in arriving at a mistaken diagnosis.

When a patient presents himself at a physician's office with a history that the cough does not respond to the ordinary remedies and on examination evidence of bronchial spasm is discovered, the condition must be suspected and a total and differential blood count ordered.

Treatment—This consists in giving course of injections of acetylarsan. Injections can be given on alternate days and a course of 6 to 12 will usually suffice The relief is almost always dramatic Urine tests must be made before injecting acetylarsan and if albuminuria is present treatment must be postponed or interdicted.

GASTRO-INTESTINAL ALLERGY

Gastro-intestinal allergy may manifest itself in buccal and pharyngeal symptoms (angioneurotic edema) "indigestion," peptic ulcer, pylorospasm, intestinal allergy (even appendicitis may be simulated) and mucous colitis

In gastro-intestinal allergy, other manifestations of allergy or a family history of allergy may be present

Fever is usually absent and eosinophilia may be present.

The treatment is similar to that of bronchial asthma. Elimination of the causative food or foods is usually sufficient; hyposensitization (oral or parenteral) is advisable in sensitivity to egg or wheat only.

CHAPTER XXIII

GENITO-URINARY DISEASES

Nephritis

Ellis (1942) distinguished two types of nephritis, type I or hemorrhagic nephritis and type II or edematous nephritis.

Type I : Hemorrhagic Nephritis

This type is characterized by a clear history of an acute infection usually of the upper respiratory tract followed one to three weeks later by a gross hematuria accompanied by general constitutional symptoms and a mild to a moderate transient edema Approximately 84 per cent of the patients make a complete recovery.

Treatment:

Rest—Bed rest is enjoined till the urine output and concentrating power are regained This usually takes from 4-6 weeks Hematuria clears up quickly but proteinuria and cylindruria may persist longer Bed rest need not be prolonged indefinitely because of their presence. The patient may be allowed to get up as soon as symptoms have disappeared and findings have become stationary with no further evidence of progression

Warmth—Patient should be kept warm and protected from chills

Foci of Infection—A careful search should be made for septic foci such as tonsils, dental roots and so forth They should never be eradicated however, during the acute phase of glomerulonephritis. A period of three months should elapse between recovery from the acute phase and the removal of the foci. It is of advantage to administer penicillin as soon as septic foci are discovered and again before their eradication

Diet—Initially a pint of milk and a pint and a half of fruit juice are permitted daily During the stage of oliguria ingestion of large amounts of fluids only helps to increase the edema As renal permeability increases and diuresis begins, more fluids can be given. The diet is also increased to include porridge, dalia, chapati, bread, butter, jam, biscuits, vegetable and fruits More protein can be added when the blood urea returns to normal and the renal concentration

tests show satisfactory progress, even in the presence of proteinuria A beginning may be made with an egg or small helping of meat, fish or dal, daily. Vitamins are given in adequate amounts. Common salt and laxatives or alkalies containing the Na ion are completely excluded.

Drugs—Potassium citras and potassium carbonate āā gr. 15-30 are given by mouth three times a day and the urine kept alkaline

Iron is administered either as fersolate tablets, 2 tablets three times a day or colıron (Evans), a teaspoon in water three times daily or again as plastules

Bowels are kept open by use of liquid paraffin or other suitable laxative

Anti-histaminics (benadryl, anthisan) have recently been used and are said to cut short the attacks

Penicillin is valuable in the presence of foci of sepsis Sulfonamides should not be prescribed.

Edema—A water balance chart should be maintained and the intake should correspond with the output, until diuresis sets in. For persistent oliguria 50 ml of a 4 3 per cent solution of sodium sulphate followed by 1 to 2 pints of ten per cent glucose solution should be run in intravenously. Diuretics are of no value Mercurials are mentioned in particular, to be condemned

Acute Heart Failure—This is treated by rest, a 1/6-1/4 gr dose of morphine, oxygen by the nasal catheter or mask, venesection and digitalis.

Hypertensive Encephalopathy—Severe headache, convulsions, coma, visual and other disturbances are most probably due to circulatory disturbances resulting in temporary ischemia and in some cases edema.

Treatment consists in the use of sedatives like barbiturates chloral hydrate and paraldehyde The most effective measures, however, are venesection and the lumbar puncture In a child 400 ml. and in an adult 600 ml. of blood are recommended to be withdrawn This may be followed by 50-100 ml. of a 50 per cent solution of glucose intravenously. The lumbar puncture should be carried out after and not before the venesection. The C. S F. should be allowed to escape slowly and the pressure brought within the normal range

Magnesium sulfate in doses of 15 to 25 grams daily by mouth or intravenously in doses of 25 ml. of a 10 per cent solution, has been recommended for the control of encephalopathy. Odel, however, question the advisability of introducing two toxic ions into the circulation in the presence of renal diseases and probable decreased excretory function

Type II : Edematous Nephritis

There is no history of a recent acute infection and no memory of hematuria. The only complaint is an insidious, slowly progressing, persistent edema. A marked proteinuria is present and the urine sediment contains few red cells, many casts especially fatty and many epithelial cells. The blood N P N and creatinine are normal, but the albumin is low and a marked lipemia is present. The patient is usually anemic. Approximately 95 per cent of these patients eventually die of the disease.

Treatment—As soon as a diagnosis has been made a period of rest and observation is advised. These patients do better in an equable climate. A quiet, regular life is enjoined and light outdoor exercise in clement weather permitted. Strenuous physical exercise, exposure to damp and cold and, indulgence in alcohol are deleterious. Reasonable precautions should be advised against infections particularly of the respiratory tract.

Diet—A diet rich in proteins (120-150 Gm daily) is advised. Fluids and common salt are restricted. Schemm (1912) recommends a large fluid intake (7 pints daily), an acid ash, sodium restricted diet. As too great a salt depletion may lead to uremia, the treatment should be undertaken only in a hospital.

Edema—Rest and an appropriate diet may induce spontaneous diuresis. The safest diuretic to employ is urea in doses of 100-200 gr daily in divided doses and given in orange juice and water. The most effective drugs, however, are the mercurial diuretics. Neptal or esidrone 2 c c. intramuscularly for adults, may be injected two or three times a week. These drugs must not be injected intravenously as catastrophic results have followed such injections. It is of advantage to give 10-20 grains of ammonium chloride 3 times a day, by mouth on the day previous to the injection. The least toxic of the mercurial diuretics is thiomerin and this should be used in preference to others.

If edema fails to respond to these measures, resort should be made to acue puncture of the legs. This is now rendered safe by concurrent use of penicillin.

Late Stage : Chronic Nephritis

The late stages of both varieties of nephritis result in varying degrees of hypertension, cardiac failure and renal failure.

The patient should lead a well-regulated life with moderation in all spheres as a keynote. He should avoid a high pressure life and retire to bed early. The bowels should be kept open. The diet should be lacto-vegetarian. In the absence of edema salt and water restriction are unnecessary.

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The treatment of cardiac and renal failure is on routine lines.

Uremia

Uremia is a condition resulting from renal insufficiency, with change in electrolyte balance and retention of nitrogenous and other waste products Uremia may be acute or chronic.

Acute Uremia—Fishberg (1944) grouped cases under three headings: pre-renal, renal and post-renal.

Pre-renal uremia is due to a fall in blood pressure and a reduction in the filtration pressure in the glomeruli below the effective level. The etiological factors are hemorrhage, dehydration and shock, and the treatment is that of these conditions.

Post-renal acute renal failure is due to obstruction in the ureters, bladder or urethra The condition may be caused by sulfonamide crystalluria, renal calculi, enlarged prostate and urethral stricture The treatment consists of removal of the block Catheterization of the bladder or ureters and lavage of the pelves are valuable

Renal causes of acute renal failure are lower nephron nephrosis, bilateral cortical necrosis and hemorrhagic or type I nephritis.

Lower Nephron Nephrosis—The general clinical pattern and the histopathological changes vary little with the etiological factors which include crushing injuries, wounds, abdominal operations, burns, blood transfusion reactions, sulfonamide intoxication, heat stroke, malaria, poisons, hemolytic anemia, uteroplacental damage, eclampsia, acute pancreatitis and shock from various causes There is focal degeneration of the lower part of the convoluted tubules and the lower nephrons and collecting tubules contain blood casts. The urine contains blood, albumin, creatin, granular casts and pigment granules The specific gravity tends to become fixed at 1010. Blood studies show accumulation of urea, potassium and phosphate Carbon dioxide combining power progressively falls, and chloride tends to decrease, probably because of inability of tubules to reabsorb it

Treatment—If the patient has had an injury or a reaction known to produce lower nephron nephrosis the following treatment is at once instituted.

1 The fluid intake is restricted to the amount the patient loses in 24 hours in respiration, sweat, feces and urine No more is allowed.

2. The patient is given a continuous intragastric drip A small bore indwelling stomach tube is introduced and 400 G. of glucose with 100 G. of

arachis oil or 200 G. sugar with 150 G. of butter with the requisite amount of fluid (1000 c c. or more) are slowly run in 24 hours. If there is vomiting, the vomitus is filtered and the filtrate added to the drip to prevent loss of electrolytes Alkali such as sodium bicarbonate is given to maintain an alkaline urine Morphine should be given for pain, and the patient should be comfortably warm but not overheated Local surgical treatment of injured areas should be carried out

Once renal failure with oliguria and progressive uremia develops, relatively ttle can be done except the employment of various dialysis methods These nclude the use of artificial kidney peritoneal and intestinal dialysis and gastric lavage One type of artificial kidney consists of a large drum on which 40-45 yds of visking cellulose are wound in spiral fashion rotates passing the cellulose tubing through a dialyzing fluid The patient's blood enters from an artery to one end and is returned to a vein from the other end Peritoneal lavage performed by placing a catheter in an upper lateral abdominal quadrant and ontinuously running 18-24 L modified Tyrodes' solution through the peritoneal avity every 24 or 48 hours The solution is made hypertonic by increasing the amount of glucose and sulfadiazine, heparin and penicillin are added to prevent clotting and infection Gastric lavage is performed by a special gastric tube with two lumens employing about 10 L of a special fluid in 24 hours Intestinal irrigation with saline is carried out with a rubber tube, a small balloon in its tip, passed various distances down the intestinal tract Object of the treatment is to keep the patient alive until tubular regeneration and spontaneous diuresis takes place As soon as diuresis exceeds 1000 c c in 24 hours, the intra-gastric drip is stopped and the patient fed by mouth on a high caloric, low protein diet containing plenty of minerals

The treatment of bilateral cortical necrosis and acute nephritis accompanied by marked oliguria or even anuria is similar to that described for lower nephron nephrosis (acute tubular nephrosis)

Chronic Uremia—Chronic uremia is a frequent termination of chronic hritis, pyelonephritis, or polycystic disease During the first stage the des-ction of renal tissue can be made out by special tests and there is neither trogen retention nor any disturbance in the electrolyte content of the blood uring the second stage there are both nitrogen retention and disturbance of electrolyte balance The specific gravity of the urine is fixed But the kidney still possesses the power of excreting sufficient water to compensate for the lack of concentrating power. During the terminal or the third stage the ability to excrete a large volume of urine is lost, progressive nitrogen retention and mineral and water disturbance are inevitable and death ensues

Treatment—A high fluid intake is advised to ensure 3 litres of urine a day The diet prescribed is a high calorie, low protein diet, containing from 30 to 50

grams of protein in a day. As a high output of urine will result in a large loss of sodium chloride, it is given daily in capsules. If sodium retention and edema are present, the amount of sodium chloride given daily should correspond to that lost in the urine This can be determined by performing the Fantus test on a 24 hour specimen of urine. A negative calcium balance is common and is corrected by giving calcium gluconate intravenously.

Anemia is treated by a transfusion preferably of packed cells

Urinary Tract Infections

Urinary infections may be acute, subacute or chronic They may involve the tract in parts or as a whole. The involvement of the kidney may give rise to pyelitis, pyelonephritis, pyonephrosis and renal and peri-renal abscesses Infections of the lower urinary tract include cystitis, urethritis and prostatitis Women are prone to infections of the urinary tract more than men Infections of the kidney give rise to lumbar pain which usually radiates downwards and in front, chills, fever, nausea, vomiting, frequency, urgency and dysuria There is usually moderate to marked tenderness in the costovertebral angle Infections of the bladder give rise to difficult and painful micturition, frequency, urgency and at times retention

Suprapubic tenderness may be present. Occasionally chills and fever occur The common pathogenic organisms responsible for urinary infections are · escherichia coli, streptococci especially *fecælis, staphylococci, aerobactor* aerogenes, pseudomonas æruginosa and proteus vulgaris.

A recurrent or resistant infection suggests obstruction and urinary stasis

Treatment—Bed rest is enjoined until the patient becomes completely asymptomatic.

Fluids—If the kidney function is not depressed enough fluids are given to ensure a urinary output of 1500 c c. a day.

Sedatives—Urinary sedatives are ordered if there is frequency and dysuria A mixture containing potassium citras 30 grs, tincture hyoscyamus 30 minims and water up to one ounce is ordered to be given three times a day and is often valuable.

Anti-bacterial Therapy—A complete urine examination is made to the nature of the infection present. An appropriate treatment is The older urinary antiseptics like urotropine and mandelic acid employed very rarely.

Mandelic acid and its salts are useful against coliform organisms and staphylococci. Against enterococcal infections mandelic acid is more active than the sulfonamides It is useless in the urea-splitting organisms such as proteus Mandelic acid salts and the necessary urinary acidifiers are irritant to the gastric mucosa and are contraindicated in renal insufficiency. Ammonium mandelate is the preparation commonly prescribed

Sulfonamides—These drugs give brilliant result in uncomplicated urinary infections by sensitive organism. Sulfonamides are active against E. coli, hemolytic streptococci, some strains of staphylococci, enterococci and proteus The most popular preparations are sulfadiazine and sulfatriad They act best in the presence of alkalies Sulfonamides should be given with caution, if they are given at all, in the presence of kidney damage. A new sulfonamide, gantrisin (NU-445) is stated to be the drug of choice in the treatment of infections due to proteus vulgaris Lazarus and Schwartz report excellent results in infections due to B pyocyaneous and E coli which failed to respond to sulfadiazine and/or streptomycin. The dose is 2 G six hourly and there are no toxic effects

Antibiotics—Penicillin is the drug of choice for infections due to Neisseria (gonorrhea), streptococcus hemolyticus and viridans and the staphylococci For infections by E coli, ærobactor ærogenes and myobacterium tuberculosis, the most effective agent appears to be streptomycin in doses of 1 to 3 G daily in divided doses intramuscularly for 4 to 6 days. Chloromycetin is effective against infections by salmonella paratyphoid. Streptococcus fecalis infections are refractory to most urinary antiseptics but yield readily to treatment by aureomycin or terramycin which antibiotics are also extremely effective in urinary tract infections due to E coli, ærobactor ærogenes and staphylococcus aureus.

For amicrobic pyuria, mapharsen or other suitable arsenical, is the only effective remedy.

Surgery—The treatment of staphylococcal infections such as perinephric suppuration and the renal carbuncle, consists of rest, the use of penicillin and surgery.

Urolithiasis

Stones may be present in the renal pelves, ureters or b[illegible]
treatment is usually a surgical problem Certain medical aspe[illegible]
important These are concerned with the prevention of infect[illegible]
stone formation and treatment of renal colic.

Fluids should be [illegible] [illegible] ll cases and adequate d[illegible]
The rest of the medical [illegible] depends upon the

the urine shows an abnormal concentration of urates, uric acid or oxalates, alkalies should be given to make the urine slightly alkaline. Potassium citrate in doses of 20 to 30 grains three times a day is satisfactory. Calsol has recently been employed for retrograde irrigation of urate calculi If there is any tendency to colic, atropine or tincture belladonna (10 to 20 minims three times a day for 2 or 3 days) should be prescribed Depropanex (Sharpe and Dhome) is another suitable anti-spasmodic. Forced fluids, alkalies and anti-spasmodics may help in the passage of small stones which may otherwise remain impacted in the urinary tract The diet should be suitably planned. When there is an excess of uric acid or urates in the urine, meat, eggs and other sources of animal protein should be cut down The ingestion of kidneys, liver or purin containing beverages such as tea and coffee should be reduced to a minimum Fruits and vegetables should be taken liberally. When the urine contains numerous oxalate crystals, restriction of articles of diet rich in oxalates is required These articles are spinach, rhubarb, tomatoes and straw-berries. The use of tea and cocoa should also be restricted. Foods rich in magnesium such as peas should be taken in large quantities Magnesium sulphate or magnesium carbonate may also be given daily

The usual treatment for phosphatic calculi is acidification of the urine, but Shorr and Carter call attention to limiting factors. (*a*) infection with ammonia forming organisms, which render useless any acidifying regime; (*b*) the coincidence of impaired renal function, making such a regime hazardous from the danger of acidosis and further renal damage. The new therapeutic approach, outlined by those authors, consists in the use of aluminum hydroxide gels to alter the urine so that it is unfavourable for the precipitation of phosphate ions The rationale lies in the formation of insoluble aluminum phosphate salts in the intestinal tract, and the corresponding reduction in the amount of phosphorus available for absorption. Reducing urinary phosphorus excretion would thus serve to prevent precipitation of the relatively insoluble phosphate ion as the calcium, ammonium, or magnesium salt The usefulness of aluminum hydroxide gels for this purpose was investigated in 22 patients receiving a constant moderately low-phosphorus diet Unlike acidifying agents, the gels are not limited in their effectiveness in the presence of ammonia-forming organisms, nor do they introduce the hazard of acidosis when renal impairment exists Shorr and Carter regard the results as highly favourable, to judge from the absence of [illegible] e in 6 kidneys and from the fate of the stones in 30 calculous [illegible]

G. S. Barrett confirms that aluminum gel causes reduction in urinary inorganic phosphorus and increases excretion of phosphate in the stool. Amphojel (alumina gel) with magnesium trisilicate was administered to 31 patients as prophylaxis against urinary calculi. In 88 2 per cent. the treatment was successful, with no evidence of recurrence or of enlargement of existing stones.

Renal Colic—The treatment consists of rest, warmth to the lumbar region, hypodermic injection of morphine ¼ to ½ grain combined with atropine 1/100 grain repeated if necessary and forced fluids

After the attack has passed the urine should be carefully examined and appropriate treatment instituted. Even if no infection is present a course of sulphonamides or appropriate antibiotic should be prescribed

In the majority of cases with calculus of some considerable size surgical treatment will be necessary. It should not be postponed too long otherwise irretrievable damage may occur. The pre-surgical and the post-surgical treatment should be along lines indicated.

As urinary calculi are common in bed-ridden patients the duration of bed rest in fractures and other conditions should be curtailed. When hyper parathyroidism is associated with the presence of calculi, it should be suitably dealt with

MOVABLE KIDNEY

In persons who are markedly underweight and also have relaxed abdominal walls, there is visceroptosis of which nephroptosis may be a part These persons usually belong to the longi-linear or hyposthenic habitus Sometimes both kidneys are ptosed, sometimes only one When only one is affected it is more often the right than the left On deep palpation during deep inspiration one feels the kidney beneath the costal margin The condition is sometimes associated with pain in the back, digestive disturbances and nervousness Rarely through kinking of the ureter or torsion of the renal vessels, there may be pain, vomiting, collapse and rapid enlargement of the kidney because of acute hydronephrosis and oliguria

In arriving at a diagnosis one must rule out gall stones, wandering spleen and tumours of the gastro-intestinal tract

The treatment of movable kidney consists of replacement of the kidney in its normal place and the application of a good abdominal binder after which patient should be made to put on weight up to a normal level In case of kinking of the ureter or torsion of the renal vessels the kidney is replaced manually, morphine administered and an ice bag placed over the renal origin In some cases surgery (nephropexy) is necessary

URINARY RETENTION

Retention may be acute or chronic. Its causes are diverse: prostatic enlargement, urethral stricture, spinal cord diseases (tabes, disseminate *sclerosis*, myelitis) and post-operative states

Acute Retention—In acute retention there is sudden and complete cessation of urination due most often to congestion of the prostate following overeating, cold, or alcoholic excesses

Treatment—The patient should not make exhausting attempts to pass water [illegible] try to relax He should lie down

preferably in a hot bath If he is still unable to void, a catheter must be used Later on it is usually possible to do without the catheter

Post-operative retention may sometimes be prevented by injections of doryl, moryl or prostigmine. Neostigmine methyl sulphate is the most recent addition to the number of drugs used for this purpose. The dose is 1 to 2 c.c. of a 1 in 4,000 solution injected hypodermically every 4 hours. If these measures do not succeed catheterization may be necessary and if repeated often sulfathiazole or sulfadiazine should be given in doses of 1 G. every 6 hours to prevent infection

Chronic Retention—Chronic retention often develops gradually. There is complete urinary retention until the bladder rises to the umbilicus after which there will be dribbling from overflow.

Treatment—Surgical resection of the prostate is advisable if the cause is prostatic enlargement Preliminary to prostatectomy treatment with stilbestrol may be tried In spinal cord diseases the treatment is more difficult. Catheterization should be postponed as long as possible as an automatic bladder may be established Urinary infections should be treated by sulphonamides or other suitable antiseptic Many patients ultimately are driven to catheter life They must be instructed how to pass the catheter so that they can do it themselves at will

INCONTINENCE

Incontinence may occur in adults and is due usually to the enlargement of the prostate or organic nervous disease.

Enuresis Nocturna—In infants the bladder is automatic Most children learn to control it during the second year of life Some, however, are slow in doing so In such children an effort should be made to ascertain the cause; phimosis, vulvitis, thread worms, diabetes insipidus or diabetes mellitus. If any causative factor is found it should receive appropriate attention. If no cause is found and the child is not mentally backward he will respond to careful guidance and encouragement to void promptly following the onset of desire. Scolding and punishment are harmful and should be avoided The child should not drink much in the evening and should void before retiring He should be woke up once or twice during the night and made to urinate The foot of the bed should be raised

Drugs—The only drugs of value are ephedrine and testosterone propionate. Ephedrine should be given in doses of ¼ to ½ grain at bed time. Testosterone propionate should be given cautiously and in small doses twice weekly by injection. Later on methyl testosterone also given cautiously is all that may be required. The dose is 10 to 20 mg. daily. This is given for several weeks and then reduced or given less frequently.

URGENCY AND FREQUENCY

Urgency is usually associated with frequency and denotes an irritable state of the bladder. It may result from an enlarged prostate with incomplete

emptying of the bladder, neurogenic or psychic factors or more commonly cystitis in which case dysuria is also at present Cystitis may result from infection, retention, stone, ulcer, tumour or instrumentation

Treatment—If it is due to disease of the prostate appropriate treatment should be instituted Otherwise fluids should be forced and an alkaline antispasmodic mixture such as the following prescribed .

R	Pot. Cit.	gr. 30
	Tinct Hyoscyamus	m. 30
	Aq. ad.	oz 1

Sig.—Three times a day.

Sulfathiazole or sulfadiazine in doses of 1 G 4 times a day is combined with the alkaline antispasmodic mixture

Vesical drainage and lavage through an indwelling catheter or suprapubic tube may be necessary In cases where urgency is due to neurogenic causes, explanation, persuasion and re-education are of value

PROSTATITIS

Prostatitis may be acute or chronic

Acute Prostatitis—In acute prostatitis associated with gonorrhea the onset is sudden and may be ushered in by a rigor. The temperature rises and is accompanied by thirst, anorexia and constipation There is deep seated pain in the perineum which extends to the end of the penis The pain is made worse by sitting, standing or walking and during micturition and defecation Sometimes there is retention of urine . when this happens a prostatic abscess should be suspected Rectal examination reveals an enlarged and exquisitely tender prostate.

Treatment—All local therapy such as instrumentation, irrigations, etc , should be immediately stopped The patient is kept in bed and heat applied to the perineum and suprapubic regions Hot rectal salines, hot baths, infra-red rays and short wave therapy with an electrode in the rectum and a pad electrode over the pubis are also useful Fluids should be forced and bowels kept open by use of mineral waters (vichy, contrexeville) An alkaline antispasmodic mixture containing potassium citrate 30 grains and tincture hyoscyamus 30 minims in an ounce of water may be given three times a day Pain may also be relieved by use of suitable rectal suppositories ·

R	Antipyrene		5 gr.
	Amidopyrene		5 gr
	Ext. Hyoscyamus		½ gr.
	Ol Theobromat	to	15 gr.

If abscesses form surgery should be resorted to

Sulfathiazole or an antibiotic should be given in appropriate dosage

Chronic Prostatitis—It may be a sequel of the acute disease or it may come on insidiously. It is usually post-gonorrheal but the infection is due to secondary

organisms rather than the gonococcus. The symptoms may be so trivial that they are easily overlooked On the other hand burning or scalding on micturition, neuresthenia, pain after coitus, premature ejaculation, loss of desire, priapism and prostatorrhea may occur. The last portion of the urine passed may be cloudy and contain mucus and threads

Treatment—The principal measure is prostatic massage. It should be given for 5 minutes twice weekly, preferably preceded by shortwave diathermy and followed by irrigation of the bladder. The regular passage of large metal instruments assists in expelling the prostatic secretion by stretching the urethral wall Sulfonamides or antibiotics must be given in appropriate dosage.

SIMPLE ENLARGEMENT OF THE PROSTATE

When obstruction is not marked treatment consists of general and hygienic measures Too much exercise should be avoided and the use of alcohol cut down to a minimum. Sexual intercourse should be indulged in moderately. If it is found to make the symptoms worse it should be prohibited altogether Bowels should be kept open and an occasional cathartic even in the absence of constipation used. Patients must not hold urine longer than it is comfortable Recently the use of estrone and gonadectomy has been recommended

Should retention occur, heat should be applied to the pubes and a catheter passed If this meets with obstruction an injection of papaverine 2/3 grain or atropine 1/100 grain is made and the catheter passed again.

Surgery—Removal by perurethral route is made in selected cases (middle lobe enlargement) and prostatectomy should not be delayed too long if general and endocrine measures do not bring relief

CANCER OF THE PROSTATE

Diagnosis should be made from simple enlargement and from prostatic calculus On rectal examination the prostate feels hard, irregular and fixed In all cases in which the diagnosis of prostate cancer is suspected the serum acid and alkaline phosphatase should be determined and the pelvic bones and spine examined radiologically The normal values of serum acid phosphatase in the male lie between 0.1 and 1.0 Bodansky unit In metastatic protsatic cancer the values are higher and values above 1.2 Bodansky units are practically pathognomonic.

Treatment—When the diagnosis is made and there is no evidence of local extension through the capsule of the prostate or of metastases, the method of choice should be complete surgical extirpation.

When there is obstruction or when metastases are evident, orchiectomy or estrogen therapy should be advised. A start is made with estrogen therapy (diethylstilbestrol 1-5 mg. daily); if this proves unsuccessful, orchiectomy may be performed. Unfortunately the beneficial results of orchiectomy or estrogen therapy are not permanent.

CHAPTER XXIV

DISEASES OF BONES

OSTEOGENESIS IMPERFECTA

(Blue Sclerotics)

A hereditary condition characterized by congenital defect in the evolution of the osteoblasts and recognised clinically by multiple fractures due to trivial accidents

Treatment consists in the protection of the child from minor injuries. When fractures occur they should be promptly attended to and deformities not allowed to occur.

ALBERS SCHONBERG'S DISEASE

(Marble Bones)

The disease is rare. It is characterized by an increased density of the bones combined with fragility which is not as marked as in fragilitas osseum. Optic atrophy and ocular palsies sometimes occur due to diminution in size of the nerve foramina Progressive sclerosis of long bones leads to obliteration of medullary cavity, involvement of the hemopoitic tissue and enlargement of the spleen and lymph glands

No treatment is known.

ACHONDROPLASIA

Achondroplasia is a disturbance of bone growth during intra-uterine life and affecting the endochondral ossification especially of the ends of long bones. It is characterized by a large head, small face, normal trunk and short limbs

No treatment is necessary If an achondroplasiac woman gets pregnant Cesarian is indicated.

MULTIPLE CHONDROMAS

(Dyschondroplasia)

The condition is characterized by a disorderly epiphysial growth both in quality and quantity The ends of the bones are broad and irregular and may interfere with joint movements Deformities due to irregular rate of growth (ulnar deviation, valgus deformity) occur. Disorderly outgrowths from the metaphyses may be clinically indistinguishable from multiple exostoses

Treatment may be needed for mechanical reasons, to correct a deformity or remove an exostosis Rarely a malignant change occurs in an area of cartilage embeded in the shaft.

OSTEITIS FIBROSA

The disease may be local and confined to one bone or it may be generalized
lve all the b generalized form is the result of overaction of

the parathyroid glands. The disease is characterized by pains in the limbs fractures and occasionally renal colic due to formation of calculi in the urinary tract. X-ray examination shows cystic tumours in the long bones The serum calcium is raised, the serum phosphorous is low and the plasma phosphatase greatly increased

Treatment—In the presence of findings such as those described above a careful search should be made for the presence of a parathyroid tumour. When one is discovered its surgical removal leads to an amelioration of the condition. If the biochemical findings are normal or the parathyroid glands do not show any tumour, operation is not indicated. Pre-operative and post-operative treatment is usually necessary. Before the operation is performed the patients calcium stores should be replenished by a diet rich in milk and injections of calcium gluconate

After the operation has been performed treatment is on general lines The physician should be on the lookout for prodromal symptoms of tetany In any case milk, calcium gluconate injections and vitamin D in large doses are necessary

OSTEITIS DEFORMANS

(Paget's Disease)

The disease was first described by Sir James Paget in 1877. Symptoms rarely occur before middle life. There are characteristic changes in the bones consisting of a rarefying osteitis combined with new bone formation under the periosteum, giving rise to a thickening There is a progressive enlargement of the skull to which the patient's attention is drawn by the larger and larger sizes in hats that he takes. The long bones become bowed and thickened. Bone pain is often present In the localized form only one bone usually the tibia is involved. The generalized form is more common and almost every bone is affected to some extent.

Treatment—Calcium, parathyroid and vitamin D have been recommended Ultraviolet rays have also been used and have eased the pain in some cases The pain in the leg is relieved by osteotomy of the tibia provided the bone is set straight. The worst feature of the disease is severe pain in the back for which no remedy is of any avail.

Leontiasis Ossea—There is enlargement of the bones which is limited to those of the skull and the face. It is probable that the disease is a localized form of Paget's disease There is no effect on the general health though headaches, deafness and optic atrophy may occur due to pressure effects No treatment is known.

OSTEOMYELITIS

Osteomyelitis is a pyogenic infection of the bony tissue. The commonest infecting organism is the staphylococcus but streptococcus, pneumococcus or other organisims may be concerned The infection may be blood borne as from a furuncle, may enter directly from neighbouring soft tissues or may reach the bone through an open wound involving a compound fracture or a periosteal injury.

The acute hematogenous variety is a severe illness and occurs usually in childhood. It is characterized by a dramatic onset with fever, pain, muscle spasm and marked leucocytosis The bone tenderness and joint splinting may not be marked and difficult to recognize during the early stages Radiological evidence of bone damage is usually late

Treatment—In acute osteomyelitis sulfonamides or penicillin administered early in the course of the disease may play an important part in aborting the infection should it be due to one of the organisms sensitive to the drug Where this is not possible surgical drainage is combined with sulfonamides and penicillin.

In the more chronic stages sequestrectomy and saucerization of the bone is required. A mixture of sulfathiazole and sulfanilamide powder is then applied locally in sufficient quantity to fill the cavity in the bone Anything from 1 to 20 G. of the drug may be required for this purpose Oral sulfonamides should be given as in acute type Petrolatum gauze may be packed in to the wound or, in case of more chronic cases used as an outer dressing only Recent work shows that penicillin used locally and systemically is a remedy of great value For details the reader is referred to the section on Penicillin

SYPHILITIC DISEASE OF BONE

It may occur either as localized gummata under the periosteum or in the medulla or diffuse gummatous osteomyelitis Both periosteum and endosteum may be involved Diagnosis from bone tuberculosis is difficult. History and other evidences of syphilis and/or positive W R are helpful.

Treatment consists in the administration of potassium iodide by mouth and parenteral use of arsenicals and bismuth Penicillin is another drug of great value

TUBERCULOSUS DISEASE OF BONE

Diagnosis must be made from osteomyelitis and syphilis Treatment is general and local. General treatment is on usual tubercular lines Fresh air, rest, nourishing diet, heliotherapy, ultraviolet rays, use of cod liver oil and calcium are the usual measures

Local treatment has often to be modified by secondary considerations, e g, destruction and collapse of the bodies of the vertebrae in tuberculosis of the spine, or involvement of joints in tuberculosis of the long bones. When these considerations are not present treatment consists of excision of the affected portion of the bone or if that is not possible, to evacuate the caseous material and remove all weight and strain from the bone by rest. For securing local rest and the immobilization, suitable splints, frames or plaster casts may be needed. Caseous material should be removed by aspiration. Sinuses or abscesses should be evacuated; no attempt at curetting should be made. Sometimes an open incision is necessary

Streptomycin has recently been used in the treatment of tuberculosi the bone. If expense is not a consideration, it is a remedy of great

CHAPTER XXV

DISEASES OF THE JOINTS

ACUTE INFECTIVE ARTHRITIS

Acute infective arthritis may occur in the course of any acute infection. The more common varieties are.

1. Acute Rheumatic Fever
2. Streptococcal Arthritis.
3. Staphylococcal Arthritis.
4. Gonococcal Arthritis.
5. Pneumococcal Arthritis.
6. Arthritis associated with scarlatina, dysentery, typhoid, etc.
7. Serum Sickness

The treatment should be directed towards the cause and to the local conditions in the joint In acute rheumatic fever, the treatment consists of rest, large doses of salicylates and local heat. The treatment is described in an earlier part of the book In streptococcal or staphylococcal arthritis, a suitable sulfonamide such as sulfathiazole or sulfadiazine is administered in adequate dosage Aspiration, intra-articular injection of penicillin after aspiration or incision and drainage may be needed.

RHEUMATOID ARTHRITIS

(Atrophic Arthritis)

It is a disease of obscure causation. The most accepted theory is that of local infection from teeth, tonsils, sinuses, gall bladder, appendix, colon, prostate or seminal vesicles Metabolic disturbances such as high blood uric acid and high cholestrol have been found in some cases Endocrine disturbances have also been thought to play an etiological part

The disease is characterized by recurrently inflamed joints with gradual development of ankylosis and deformities and also by varying systemic manifestations such as malnutrition, spleno-megaly ard a persistent low grade pyrexia The writer has seen two patients in whom rheumatoid arthritis was found associated with valvular disease of the heart. The involvement of the joints is bilaterally symmetrical and proceeds centripetally; the small joints of the fingers are involved first followed by wrists, elbows, ankles, knees, etc. Finally the spine may also get involved

Treatment—Measures of approved value are·

1. *Rest*—Complete bodily and mental rest preferably away from home is the most important single measure. A rest cure of six months to a year has amply rewarded those (even cured some) who have had recourse to it.

Even when complete rest is not possible the patient should have a mid-day rest of 1 to 2 hours and retire early in the evening

2 *Nutrition*—It is important to use building up measures,—a high calorie, a high vitamin diet, iron, liver, vitamin concentrates particularly B complex and vitamin C, and when anemia is refractory, repeated small transfusions of blood

3 *Physical Therapy*—Physical therapy is unfortunately almost completely neglected by the physician and used only by the cultist and the quack Heat may be used in any of the forms described in the section on Physical Therapy This should be combined with massage and passive and active exercise

It is wise to have light general body massage in the morning and evening During the day heat is applied and followed by local massage above and below the joints (not over) and the patient advised to exercise affected areas cautiously. A flare-up in symptoms should cause discontinuation of this type of treatment.

4 *Orthopedic Measures*—An orthopedic surgeon should be consulted and joints properly splinted to promote rest and healing Splints should be applied so that if fixation of a joint occurs, it will be in its most useful position

The patient must be on a hard bed and sleep without a pillow. Suitable positions in which the joints should be supported are

Spine in extension, Shoulder in 80 degree abduction, 135 degree external rotation, Elbow in 135 degree flexion and mid-rotation of the fore-arm with pronation and biceps exercises, Wrist in 135 degree extension with the finger and thumb semiflexed and the thumb in opposition, a position such as may be obtained when grasping a cylinder; Hip, 180 degree extension and 20 degree abduction in mid-rotation, Knee, 180 degree extension, Foot, 90 degree dorsiflexion

All splinted joints should receive mild passive and active exercises to prevent muscle atrophy and contractures

Surgical treatment should be considered in established deformities; it should not, however, be used unless the arthritic process within the joint is quiescent

5 *Eradication of Septic Foci*—Far too much has in the past been written on the causation of rheumatoid arthritis by the presence of septic foci The pendulum is now moving in the opposite direction and although it is advisable to eradicate an obvious focus, indiscriminate removal of teeth, tonsils, gall bladder, etc, is not advised.

6 *Analgesics*—Salicylates are effective in relieving pain The best salicylate to use is aspirin It may be given in doses of 10 to 60 grains in a day Phenacetin may be combined with it If nervous symptoms are present bromides and phenobarbitone may be given In patients with severe pain, pethidine in doses of 75 to 100 mg by mouth every three or four hours, is

useful Cinchophen and neocinchophen will relieve pain but are toxic and not recommended.

7 *Cortisone*—Hench has recently reported the disappearance of the disease when jaundice from any cause appears As the disease also recedes during pregnancy Hench and his co-workers thought the remission might have a relation to the increased circulation of the adrenal cortical hormone Kendall investigated the effect of different cortical hormones and found that 17-hydroxy-11-dehydrocorticosterone also called compound E or cortisone given parenterally in 100 mg doses was effective in inducing a remission both in rheumatoid arthritis and rheumatic fever The drug has to be given parenterally and daily injections are necessary as in the case of insulin in diabetes. The pituitary A C. T H is also effective, the dose being 25 mg daily.

8 *Gold Therapy*—The results from gold therapy of rheumatoid arthritis are probably no better than when other measures are employed In refractory cases, however, and after carefully explaining to the patient and the relations the dangerous nature of the therapy, the treatment may be cautiously begun by those fully conversant with it The compounds generally used are sodium gold thiosulfate, sodium gold thiomalate (myochrysine), and gold thioglucose (solganol B) Only the thiosulfate may be given either intravenously or intramuscularly, the other two are given only intramuscularly. The initial dose is 10 mg This is increased very gradually up to 50 or 100 mg per week, the size of the dose depending upon the patient's reaction to the previous dose A total of 1 0 to 1 5 Gm is considered to be a course. After a rest of 2 to 3 months a second course may be given.

Between 15 to 40 per cent of patients treated by gold develop toxic reactions,—dermatitis, stomatitis, toxic jaundice, purpura, granulocytopenia, etc

Recently BAL (British-Anti-Lewisite) has been recommended in the treatment of poisoning by heavy metals

STILL'S DISEASE

Still's disease is the name given to rheumatoid arthritis in children The treatment is on lines similar to those described under rheumatoid arthritis

MENOPAUSAL ARTHRITIS

The most useful single measure is the use of the estrogenic hormone. It may be given as injections at the commencement. Later on stilbestrol may be given by mouth Thyroid ¼ grain twice daily may also be used in the absence of hyperthyroidism and tremor Thyroid is often given combined with iodine A useful preparation is alphidine (Oppenhiemer) or Lugol's iodine Aspirin and other analgesics are useful for relieving pain The bowels should be kept open by dietetic measures and use of suitable laxatives. Septic foci should be attended to and physical therapy in the way of massage, movements, heat, light and diathermy exploited

OSTEOARTHRITIS

(Hypertrophic Arthritis)

It is a degenerative disease and occurs in older age group There are proliferative bony changes about the joints and a gradual wearing out of the cartilages The disease may be mono-articular or poly-articular Knee joints are most frequently affected in women, hip joints in men In hands carpo-metacarpal joints and terminal interphalangeal joints (Heberden's nodes) are involved Ankylosis never occurs The mechanical strain of obesity and trauma probably play a part in the causation

Treatment—No specific treatment is known that will influence for good the course of the disease Rest, heat, massage, movements, suitable exercises and salicylates are all that one can offer. Septic foci if present should be suitably treated Obesity should be treated on lines laid down elsewhere Vitamin B_1, in large doses (30-900 μg per week) for several weeks i m. is said to give encouraging results.

Gout

It is a metabolic disease with recurrent attacks of arthritis The blood uric acid is raised during the attacks (6 to 14 mg per 100 c c) but may be normal (2 5 to 3 mg per 100 c c) during quiescent periods The acute attacks are usually brought on by an indiscretion in diet but injury, over-exertion, exposure to cold, excessive mental strain or a surgical operation may precipitate attacks. The joint most commonly affected is the metatarso-phalangeal joint of the great toe Tophi occur in and around the joints. The disease is often hereditary and extremely uncommon in women

Treatment of Acute Attacks—The patients should be confined to bed The bowels should be opened by a dose of hydrarg. subchlor 2 grains at bed time followed by saline in the morning The drug par excellence is colchicine It is given in tablet form in doses of 1/100 grain Doses are given every 2 or 3 hours till diarrhea ensues The drug must then be withdrawn. In future courses when colchicine is used it must be given just short of the diarrhea dose. The wine and tincture of colchicine are highly unsatisfactory and should not be used ACTH 10 mgms every 6 hours i m. is of value Colchicine should be given concurrently to avoid recurrence.

Salicylates should be used in conjunction with colchicine and help in the excretion of uric acid The dose required is 15 to 20 grains, with double the quantity of sodium bicarbonate, three or four times a day

The diet should be lacto-vegetarian. Meat, eggs, fish, liver, sweet breads, brain, tea, coffee and alcohol must be avoided Fats should be restricted and fluids forced Locally heat should be applied by use of kaolin poultice, mud or peat packs, infra-red rays or diathermy.

Treatment between Attacks—The diet should be low in calories (particularly if obesity is associated) and in purin forming foods. Sweet breads, liver, kidney and sardines should be forbidden. A small helping of meat may be allowed at

one meal. Vegetables and fruits should be taken in plenty. Strawberrie spinach, cauliflower and rhubarb are generally prohibited. So also is alcoho Tea or coffee may be permitted in great moderation. Fats in the diet shoul be curtailed. Plenty of fluids should be taken.

The clothing should be warm and chills prevented. A hot bath followe by a brisk rub daily is of advantage Exercise in moderation is beneficial A occasional calomel at bed time followed by a morning saline is advised If th patient can afford he should take an annual cure at a spa.

Chinchophen or neocinchophen $7\frac{1}{2}$ grains thrice daily for 2 days in the wee prevents acute attacks but has been attended by severe liver damage and deatl Recently sodium salicylate 20 grains combined with sodium bicarbonate 20 grain three times a day for 3 days in the week has been given and is said to help th *excretion of uric acid as well as cinchophen.*

Spondylitis

Arthritis of the spine occurs in two main forms. spondylitis osteoarthriti and spondylitis rhizomelique.

Spondylitis Osteoarthritis

The causation and pathology are similar to osteoarthritis arising in an other joint Symptoms when they occur are due to pressure of osteophyte on nerve rests or reactionary fibrositis Pain may be severe but is often absen In more advanced cases there is muscular wasting and disturbances of sensatio Diet should contain ample provisions for vitamins Vitamin concentrates ar said to be of value Treatment is similar to that of osteoarthritis elsewher Hot packs, contrast baths, massage, movements, suitable exercises and in sever cases bed rest with fracture boards under the mattress and analgesics are value. In refractory cases deep X-ray therapy should be tried.

Ankylosing Spondylitis

By many the disease is considered to be rheumatoid arthritis of the spine Others, however, think it to be an independent entity. The disease usuall occurs in males in early twenties The sacro-iliac joints are usually the firs *to be involved Gradually the intervertebral and costovertebral* joints ge involved. The spine becomes rigid and the thoracic cage immobile If th disease remains unchecked it spreads to involve hips, knees, shoulders, elbow and in severe cases, joints of the hands and the feet.

Treatment—This is similar to that of rheumatoid arthritis Gold, if given should be used with greater caution than in rheumatoid arthritis.

Local Measures—A plaster of paris spinal shell is of value in acute cases During subacute cases a spinal brace during day and a plaster shell at night is advisable.

Special breathing exercises are indicated to prevent immobility of th thoracic cage. Heat, massage and hydrotherapy are valuable modes of therapy The value of deep X-ray therapy has recently been questioned.

FIBROSITIS

It is a non-suppurative inflammatory condition of the fibrous supporting tissue of the body. It may occur as inflammation of the joint capsules (capsulitis) of the sheaths of nerves (neuritis) of fibrous tissues of muscles (myositis) and of bursae (bursitis). The etiology is still unsettled but focal sepsis, metabolic defects, failure of digestion with absorption of toxic products, chills, trauma and in a few cases true gout have been responsible.

Treatment—Septic foci should be eradicated, dietary faults corrected, bowels kept open and attention paid to proper clothing and regular exercise. If patients are obese, measures for weight reduction are important

Acute Stage—During the acute stage the patient is put to bed. The bowels are opened by calomel at bed time followed by Epsom salts in the morning A light lacto-vegetarian diet is prescribed and the patient asked to take plenty of fluids. Alkaline mineral waters (Vichy) are excellent. For control of pain, analgesics like aspirin, calcium aspirin, sodium salicylate combined with sodium bicarbonate, novalgin, etc, are indicated 3 or 4 times a day If a gouty basis is suspected vinum colchici in 15 minim doses may be given combined with salicylates three times a day.

Local treatment consists of rest to the part, heat and counter-irritation Massage is usually contra-indicated during the acute stage If the shoulder joint is affected the arm may be kept in a sling, in intercostal fibrositis strapping with adhesive plaster in full expiration may be used and in mild sciatica a splint or light weight extension may be applied Heat may be used as radiant heat, infra-red rays, short wave diathermy or by use of electric pads, linseed and kaolin poultices, mud and peat packs, etc

Subacute and Chronic Stage—During this stage massage is of great value. It should be followed by passive and later on active movements Other physiotherapeutic measures are also of use Analgesic drugs like aspirin, novalgin, etc, should be given 3 or 4 times a day The value of iodine, sulphur and arsenic has been exaggerated

Local Infiltration—Infiltration with a ½ per cent solution of procaine in normal saline is very valuable in fibrositis involving the capsules and ligaments of joints, neuritis due to involvement of nerve sheaths and localised persistently painful areas situated in muscles. The amount of solution required varies greatly in different situations In the occipital region 3 to 5 c c. may be ample For lumbar fibrositis and in sciatica as much as 40 to 60 c c may be required. Injections are made in and around the tender spots

The injection is followed by a course of heat and massage

In more advanced cases manipulation under a general anesthetic may be required

Fibrositis of the Shoulder Joint—The treatment consists of heat to the joint followed by gentle stretching This should be continued so long as the range of movement goes Infiltration of the joint with ½ per c

procaine solution should then be tried. The solution is introduced through the deltoid beneath the tip of the acromian and deposited in front, behind and above the joint, which is then gently manipulated. In long standing cases manipulation under a general anesthetic may be required.

LOW BACK PAIN

Low back pain may be due to a variety of causes:

1. Acute ligamentous or muscular strains from sudden trauma.
2. Fibrositis of the lumbar muscles.
3. Postural defects, obesity, high heels, flat feet, sagging mattresses, etc.
4. Congenital abnormalities of low back, such as spina bifida occulta, sacralization of the last lumbar vertebra, etc.
5. Protrusion of an intervertebral disc.
6. Spondylitis deformans or spondylitis atrophica
7. Neoplasm, osteomyelitis, caries spine
8. Referred pain from abdominal or pelvic viscera.

Treatment—As far as possible the cause should be ascertained In many patients in spite of a thorough clinical and radiological examination no cause whatsoever can be found.

The bowels should be kept open, postural defects corrected and any pathological conditions present treated The rest of the treatment is symptomatic. Local heat, rest to the spine, massage, manipulation and analgesics If pain persists tender spots should be infiltrated with ½ per cent solution of procaine. The injection should be followed by local application of heat and massage.

SCIATICA

Sciatica may be symptomatic or idiopathic. The symptomatic form may depend upon foci of infection, gout, diabetes or disease of the spine, hip joints, pelvis or rectum *The pain often begins in the back and radiates* down the thigh into the calf and foot. It is exaggerated by standing or walking. The pain is also increased by extension of the knee when the hip is flexed (Lasegue positive). The idiopathic type is unilateral. Bilateral sciatica should make one think of disease of the spine, neuritis or a radiculitis

In acute cases treatment consists of rest in bed, local applications of heat and internal administration of analgesics (aspirin, phenacetin, novalgin, optalidon, saridon). Parenteral use of thiamin 50 mg. daily is also recommended.

Injection treatment is resorted to, in cases where the ordinary measures, *i e*, rest in bed, heat, analgesics and large doses of vitamin B_1 fail. It is more suitable in subacute and chronic cases though acute cases have also been treated successfully. In middle and low sciatica injections of nerve trunk (novocaine Gm. 1.5, normal saline 60 c.c.) and in the last resort epideural injections (10 to 20 c.c. of 40 per cent anti-pyrene) are indicated. In high sciatica Cathlean's

epidural injections are made from the very start. A single injection may be sufficient but in more resistant cases 2 to 5 have been necessary.

Injections of oxygen have also been recommended. The needle is introduced in the neighbourhood of the nerve sheath and joined to an oxygen cylinder. Oxygen is allowed to flow in till the parts are ballooned and emphysematous. After 3 or 4 days the treatment can be repeated.

CHAPTER XXVI

DISEASES OF THE SKIN

IMPETIGO CONTAGIOSA

The disease occurs most frequently in children. The commonest variety is characterized by a sudden crop of localized erythematous areas, upon which rapidly appear thin walled vesicles and bullae. These lesions soon turn pustular and then rapidly dry up, leaving thin, honey coloured, loosely attached crusts which drop off without scar formation. The disease is produced by infection with a streptococcus

Treatment—The crust should be removed by a boric starch poultice and an ointment containing 5 per cent sulfathiazole (cibazol ointment) or *sulfadiazine applied; water miscible emulsion of 5 per cent sulfathiazol or* sulfadiazine is better Local applications of a penicillin cream should be used for refractory cases. Another effective application is the following solution dabbed on several times daily

℞ *Cupric. Sulph*	*gr.* 1½
Zinc Sulph	gr. 3
Aq camphor	oz. 1

FURUNCULOSIS

Furunculosis is a recurring deep staphylococcal infection of the hair follicles and sebaceous glands The disease occurs fairly frequently in children and others who consume large amounts of sweets. It is particularly common in rainy season when mangoes abound. The disease is often associated with diabetes. An underlying scabies or pediculosis may be present.

Treatment—The treatment of single boils is not a difficult matter. The skin is painted with a 1 per cent aqueous solution of gentian violet once daily and hot wet dressings of 10 per cent ichthyol in water applied every 2 to 3 hours until the furuncle bursts or comes to a head and is surgically evacuated.

For recurrent boils attention should be paid to the hygiene of the skin, the bowels kept open, septic foci eradicated, any constitutional abnormality treated and a diet with a low carbohydrate content prescribed Sweets, sugar, fried foods and in season mangoes should be curtailed.

A mixed stock staphylococcal vaccine is of value. Injections of stanno-manganese (Bengal Immunity) are recommended.

Recently small doses of thyroid ½ grain twice daily has been used for long periods with great success.

Sycosis

It is a staphylococcal infection of the orifices of the hair follicles and affects chiefly the bearded region. The condition often persists for months and leaves behind scarring and alopecia.

Treatment—This consists in keeping the area shaved or [illegible] temporary epilation and then applying antiseptics. Suitable preparations are using quinolor compound (Squibbs), cibazol ointment and penicillin or [illegible] still bacitracin cream. Hot sulphur solution or potassium permanganate compresses are also of value. Staphylococcus toxoid or antitoxoid injections have been recommended.

Acne Vulgaris

It is an inflammatory skin disease occurring in adolescents. The lesions (papules, pustules and comedones) appear on the face but the interscapular and sternal regions may be involved. The causative organism is believed to be acne bacillus with staphylococci as secondary invaders.

Treatment—The bowels should be kept open, septic foci eradicated and the skin kept clean by free use of a good soap and water. All manipulation and squeezing of the involved parts must be stopped, except for skilful and gentle removal of comedones at infrequent intervals preferably by a physician.

Lotio Alba—Before retiring at night the face is washed with sulfur soap and hot water and dried. The following lotion is then applied

R Zinc Sulphate	dr 2
Potas Sulphurata	dr 2
Aq Rosæ	fl oz 4

It is washed away again in the morning with soap and water, and the face after drying dusted with talcum containing one dram of sulfur to the ounce.

Vaccines—Both stock and autogenous vaccines have been employed but the results have not been very successful.

Hormones—Acnestrol, an inexpensive lotion containing micronized stilbestrol dilaurate gave excellent improvement in 33 males out of 36 but in only 3 out of 48 females.

X-rays—In any but mild cases of acne, X-ray treatment may be given once weekly for 6 doses. The total dose during the period should not exceed one and a half skin doses.

Ringworm

The disease may occur in the following principal forms

1. *Vesicular and Scaling*—Both forms predominate on fingers, toes, palms and soles.

2 *Macerated*—It is the familiar lesion occurring between the breasts The patches present a clean white and sodden look

3 *Scaly*—Patches occur on the scalps of children.

4. *Maccular*—It occurs in two forms, the well-known marginated lesions in the groins, axillæ and below the breasts and the ring-like elevated lesions on the face, neck and hand.

Treatment :

1 *Tinea Pedis and Tinea Manuum*—Treatment must be varied according to the different degrees of inflammatory reaction in the lesions In acute vesicular or bullous type associated with secondary infection wet dressings of a saturated boric acid solution or 1 20,000 solution of potassium permanganate are applied every 2 hours until the acute reaction has subsided. After this a keratolytic is employed for removing the infected skin. For this purpose Whitfield's ointment (acid salic. gr. 15, acid benzoic gr. 30, vaseline oz. 1) may be used and if necessary alternated with a more soothing fungicide such as 5 per cent of sodium propionate or sodium undecylenate in petrolatum

2 *Tinea Unguum*—Treatment should consist of active removal of infected nail tissue

3 *Tinea Corporis (Ringworm of the Body)*—Herpetiform, annular and circinate lesions respond well to 4 per cent tincture of iodine in 70 per cent alcohol twice a day for 3 or 4 days Care should be taken to avoid a chemical burn An alternative treatment is the use of half strength Whitfield ointment alternated with undecylenic acid-undecylenate mixture in petrolatum For ulcerative lesions it is necessary to use wet compresses of saturated boric acid preliminary to use of fungicidal agents. In case of encrusted and recalcitrant lesions, crusts must be loosened with liquid petrolatum and the fungicidal treatment commenced

4 *Tinea Cruris*—Application of 3 to 5 per cent of precipitated sulfur and 3 per cent of salicylic acid in equal parts of lanoline and vaseline may be alternated daily with preparations of undecylenic acid-undecylenate mixture Another non-irritating fungicidal jelly which is extremely effective is one containing 0 133 per cent phenyl mercuric acetate (mersagel, Glaxo).

5 *Tinea Capitis*—Treatment of choice in non-inflammatory cases is roentgen epilation Before irradiation the head is clipped Epilation follows the radiation in 18 to 21 days and during this period mersagel or undecylenic acid-undecylenate mixture is applied twice daily. The hair is shampooed once daily before the evening application The diseased hair are identified under Wood's light and pulled out by tweezers

If inflammation is present roentgen therapy is not indicated and treatment consist of shampoos, fungicidal agents and pulling out the affected hairs

6. *Tinea Versicolor*—Soap and water should be used freely. The parts should be dried and fungicidal preparations like mersagel, undecylenic acid-undecylenate mixture or a saturated solution of sodium thiosulfate should

be applied Crocker recommends the use of a 5 per cent solution of sodium thiosulfate followed by 3 per cent tartaric acid as even more effective.

SCABIES

The disease is due to infestation by the female itch mite, sarcoptes scabies Lesions are found most often between the fingers, on the volar aspect of the forearms, around the nipples and on the genitalia Itching is intense and secondary infection from scratching may take place

Treatment—The patient is given a hot bath at bed time. Hot water and soap are freely used and the affected regions scrubbed with a soft nail brush After drying a 5 per cent sulfur ointment is well rubbed in The procedure is repeated on three consecutive nights On the fourth morning the patient gets a thorough bath and complete change The infected clothes, bed linen, towels, etc, are autoclaved or ironed with a hot iron A better method of using sulphur is one advocated by Parker The skin is painted or sponged with a 25 per cent solution of sodium thiosulfate. This is allowed to dry and 5 per cent hydrochloric acid painted The procedure is repeated once immediately and then on 3 successive nights

The sulfur treatment of scabies may give rise to a dermatitis if persisted beyond three days A soothing ointment containing zinc and starch is required to allay the inflammation

Benzyl benzoate has recently been used in the treatment of scabies with success. A mixture composed of equal parts of benzyl benzoate, soft soap and rectified spirit is painted all over the body with a brush The solution is allowed to dry and a second coat applied The following day a bath is given. A useful proprietary preparation is uniscaboint or ascabiol

Benzyl benzoate has also been used in combination with D. D T.:

Benzyl Benzoate	10 parts
D D T.	1 part
Benzocaine	2 parts
Tween 80	2 parts
Water	to make 100 parts

The mixture is sprayed on from neck to foot and then gently rubbed in with a piece of gauze. No preparatory bath is taken and patient is instructed not to bathe for 24 hours after treatment He is asked to change into a complete set of clean clothes and that night into clean night clothes and bed linen

All the members of the family should be treated at the same time and clothing and linen disinfected to prevent re-infection

"Tetmosol" lotion 5 per cent and tetmosol soap has been found effective in prophylaxis and treatment by Melanby.

PEDICULOSIS

The most useful agent is D. D. T. (dichlor-diphenyl-trichlorethane). It may be used in the form of a spray (formula given under Scabies) or as a 10 per cent powder.

Another useful delousing agent is pyrethrum. MYL powder is a mixture of pyrethrum and an activating substance which increases the effectiveness of pyrethrum about 40 times It was used in the war previous to the date of introduction of D D. T.

Both MYL and D D T proved invaluable in the control of typhus during the last Great War.

The following applications are also effective :

1. Mercuric Chloride gr. 4
   Spt Vini Rect ad. āā oz. 4

The parts should be well treated and a soap and hot water wash given in half an hour. The treatment may be repeated if necessary.

2 A mixture of xylol, ether and rectified spirit in equal parts is employed The parts are well treated As the mixture is inflammable treatment should only be applied where there is no naked light After half an hour the affected part is washed with soap and water. After drying the nits are removed with a soft comb One treatment is usually enough

3 A 2 per cent pyrethrum ointment kills both lice and nits in one application

4 A mixture of equal parts of kerosine oil and cotton seed oil is applied for 24 hours The scalp and hair are then washed and dried. Several treatments at intervals of few days may be needed

5. Another very effective agent is a preparation containing D. D. T. 2 per cent.

ECZEMA

It is a non-microbic inflammation of the skin due to a number of different external and internal causes, and characterized by erythema, vesication, weeping and exudation, formation of crusts and scales, thickening and pigmentation and as a rule intense itching. Approximately one-third of the cases are due to external causes and about one-sixth are caused by the occupation of the individual. The eruptions last for weeks, months and years and show a marked tendency to relapse. A large proportion of the patients show sensitization to various types of food and a much larger proportion have digestive disturbances.

Treatment—A careful search should be made for the presence of any irritants If one is discovered the patient should be removed from ... The diet should be simple. Alcohol, coffee, spices, highly seasoned ods and large quantities of meat should be avoided. Carbohydrate intake should be reduced If any particular food is known to have a causal relationship, it should be eliminated In a few cases salt-poor diets have proved of great value. Vitamin B complex may be given by mouth. Water should be drunk in liberal amounts Septic foci or any constitutional abnormality discovered should receive proper attention.

Internally drugs are of no value Injections of stano-manganese have been used with encouraging results. Autohemotherapy has also been recommended and successful results reported in a few cases

Local treatment varies with the type of lesion present Soap and water should not be used for cleaning Olive oil or normal saline may be employed for this purpose

(a) *Acute Papular or Papulo-Vesicular Eczema*—The skin is often so irritable that salves, ointments or pastes are poorly tolerated In these cases a 0 5 per cent solution of salicylic acid in dilute alcohol followed by a bland dusting powder may be applied every 3 or 4 hours

R Acid Salicylic	gr. 20
Dilute Alcohol	oz. 8

R Starch	
Talcum āā	*oz. 1*

As the erythema and swelling subside ointments and pastes may be used.

R Zinc oxide	
Talcum	āā dr. 4
Petrolatum	oz. 1

or

Zinc oxide

Another useful delousing agent is pyrethrum. MYL powder is a mixture of pyrethrum and an activating substance which increases the effectiveness of pyrethrum about 40 times It was used *in the war previous to the date of* introduction of D. D T.

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R Acid Salicylic	gr 20
Dilute Alcohol	oz. 8

R Starch	
Talcum āā	oz 1

As the erythema and swelling subside ointments and pastes may be used.

R Zinc oxide	
Talcum	āā dr 4
Petrolatum	oz 1
or	
R Zinc oxide	
Starch	
Glycerine	
Aq Dest	āā dr 4

Under this treatment the papules loose their redness and become darker. At this stage tar preparations should be added to the paste A useful formula is the following:

R Zinc oxide	
Talcum	āā dr 2½
Ol. cade	m 5
Petrolatum	dr 5

A proprietary preparation of coal tar (tar dermament P. D. & Co). may also be used with advantage

(b) *Acute Weeping Eczema*—Bland wet dressings like the following are efficacious·

1. Lead water diluted 5 to 8 times with water
2. Solution of aluminum subacetate diluted nine times with water.
3. Aqueous solution of ichthyol 1 in 100.
4. Aqueous solution of gentian violet 1 in 100

The gauze should be folded 3 or 4 times soaked in the solution and applied. The dressings are changed every 10 to 15 minutes

A mixture of equal parts of lime water and olive oil may be tried if the aqueous solutions are not well tolerated

With improvement in condition pastes and ointments are prescribed. A useful one is Lassar's paste

R Zinc oxide	
Amylum	āā dr. 4
Petrolatum	oz. 1

In the final stages coal tar preparations are incorporated in the paste. To begin with 7½ grains of crude coal tar may be added to the Lassar's paste Gradually the amount of coal tar may be doubled or even quadrupled.

(*c*) *Secondarily Infected Eczema*—A boric starch poultice is used to remove crusts and then a 5 per cent ointment of sulfathiazole in vanishing cream applied three times a day The boric starch poultice is made as follows: A teaspoon of boric acid is mixed with 4 teaspoons of starch and made into a thin paste with water To this is added 15 ounces of boiling water, the mixture being stirred all the time The poultice is spread on lint and applied.

After the suppuration is relieved, it is necessary to treat the exudative condition with a solution of aluminum acetate (15 grains to an ounce) or any of the other solutions listed under weeping eczema Following the lotion a simple zinc ointment may be used

(*d*) *Chronic Eczema*—In this condition there is often pigmentation and much thickening If any superficial inflammatory reaction is present, it is treated in the same manner as in acute or subacute cases The chronic thickening is then best treated by first painting a thin coat of oil of cade on the skin and then bandaging with the following ointment:

R Lead oleate plaster	oz. 3
Ol Lavendulae	m. 20
Petrolatum	oz. 2

Sig.—Diachylon Ointment If this treatment is not well tolerated the part may be bandaged with Lassar's paste after painting oil of cade. The dressing may be left on for several days and need not be removed unless the patient complains of burning or pain After the thickening has been treated by the use of bandages, the treatment is carried out by application of tar ointments or pastes

X-ray therapy is often of value in refractory cases.

(*e*) *Infantile Eczema*—In infants external irritants are not common as causes; faulty diet or individual predisposition are more important. In cases with marked or moderate exudation moist dressings (aluminum subacetate or lead water diluted) should be applied cold and frequently changed. Later on a coal tar ointment may be employed. Sutton recommends the following formula:

R Crude coal tar	dr. ½
Zinc. oxide	dr. ½
Petrolatum	oz. 1

Lewis Webb Hill reports on the use of a soya bean flour preparation for replacing milk in infantile eczema. The composition is soya bean flour 67 5 per cent, barley flour 9 5 per cent; olive oil 19 0 per cent; sodium chloride 1 3 per cent; and calcium carbonate 2 7 per cent. *Sobee* (Mead-Johnson) is a similar proprietary food. Recently aminoids are recommended in place of milk

Urticaria

1 It is an allergic disease, the allergen commonly being an article of food In an acute attack a brisk purgative and a light diet may be sufficient to clear up the eruption in a day or two An injection of adrenalin chlor 1 in 1,000 (3 to 10 minims) subcutaneously helps to clear the eruption rapidly For local treatment a lead and tar lotion is of value:

R Liquor Pic. Carb.	...	10
Liq Plumb Subacet. Fort	..	10
Zinc Oxid.	.	20
Glycer	...	20
Aq	..	ad 200

2 *Diet*—If any article of food is known to precipitate attacks it should be eliminated. The food should in any case be lacto-vegetarian and simple Straw-berries, eggs, fish and highly spiced foods should be forbidden

Fluids—Fresh water and fruit juice may be consumed in liberal amounts

Colon Lavage—Colon lavage on alternate days for a period of 3 to 4 weeks is often valuable

3 In refractory and long persisting cases the etiology is often obscure The following measures are, however, often rewarded with success

(*a*) Benadryl 50 mg t i d orally alone or combined with ephedrine

(*b*) Antistine 1 tablet 4 times a day or by injection

(*c*) Pyribenzamine 50 mg. t i d orally

(*d*) Vitamin K in the form of one tablet synkavit daily for 3 weeks

(*e*) Administration of alkalies, pot cit 30 grains t i d

(*f*) If achlorhydria is present administration of hydrochloric acid (15 minims of dilute acid in water with meals)

(*g*) Autohemotherapy. Twenty c c of blood are withdrawn from the cubital vein and injected into the buttock. The treatment is repeated twice weekly for 6 injections

(*h*) Histamine desensitization has been described in the chapter on Recent Progress

(*i*) Nicotinic acid or niaconide both orally and by injection have been employed and good results are claimed

Pruritus

Pruritus or itching may be caused by many factors:

1 Irritation from uncleanliness

2. Irritation due to vegetable, chemical and mechanical agents.

3 Parasitic infestations such as pediculosis, scabies, etc ; in anal pruritus pin worms

4 Itching dermatoses

5 Toxemias and ingestion of certain drugs

6 Systemic diseases like diabetes, jaundice, Hodgkin's disease and hyperthyroidism

7 Endocrine factors

8 Nervous and psychogenic causes

A careful history and a thorough physical examination should be made to determine the cause If one is found, suitable treatment should be instituted

General measures include personal cleanliness, tepid baths containing sodium bicarbonate or starch, simple lacto-vegetarian diet, attention to bowels, colonic lavages, liberal amounts of water and anti-pruritic lotions A lead and tar lotion as described under urticaria may be used Calamine lotion containing 1 per cent phenol or 2 per cent menthol is also satisfactory Ergotamine tartrate may be given in doses of 1/120 grain subcutaneously but is unsuitable for continued use because of the danger of gangrene Adenosine 20 mg /1 c c. in gelatine is recently recommended to be injected intramuscularly. The dose is 1 c c daily for seven days •

Treatment by X-rays is often useful in refractory cases

Seborrheic Dermatitis

It is a scaly affection and involves the scalp (dandruff), the sternal region and the back of ears

Treatment—The scalp and the affected parts should be kept clean with soap and water The following applications are used after drying:

R	Precipitated Sulphur	...	dr 1
	Lanolin	...	dr. 4
	Petrolatum	...	ad. oz 2

The ointment should be rubbed into the skin or scalp every night.

R	Resorcinal	...	...	dr. 2
	Alcohol	...	...	oz 1
	Water	...	...	ad. fl oz. 4

Sig —Rub into the scalp every other night

Recently a shampoo containing 2 5 per cent selenium disulfide has been used with great success

In cases with secondary infection a 5 per cent ointment of sulfathiazole in vanishing cream applied twice daily is useful

Frequent washing of the scalp with soap and water is important for prophylaxis

Alopecia

The treatment of alopecia depends upon its cause. In alopecia that follows enteric and other prolonged fevers no treatment is necessary and the hair grows in due course of time. In syphilitic alopecia anti-syphilitic measures are indicated. In traumatic alopecia and scar formation no treatment is of any avail

Alopecia Areata—In alopecia areata measures calculated to improve general health, eradication of septic foci and counter-irritants are of value. A suitable preparation is the following.

℞ Acid Lact.	.. dr 6
Ol Ricin	dr 3
Spt. Meth Indust. ad	. oz 6

Other useful preparations are tincture iodine or liquid phenol applied to the affected areas once a week

Ultra-violet rays may be given in short courses of 3 to 4 weeks twice weekly. Vitamin concentrates, thyroid extract and estrogenic hormone have also been used with encouraging results

Alopecia Prematura—The disease commences about the age of 30 years. In other respects it does not differ from senile alopecia. Heredity is believed to play a very important part. Tight hats, mis-treatment and over treatment of hair, and seborrheic dermatitis have been incriminated as causal factors. According to White seborrhea is the chief factor in 79 per cent of the cases

Treatment—If any constitutional abnormality is detected, it should be appropriately treated. The diet should be adequate in vitamins, if necessary vitamin concentrates may be given. Digestive disturbances should be corrected. In many cases the internal use of arsenic is followed by a favourable result

℞ Arseni Trioxidi	gr ½
Massæ Ferri. Carbonate	gr 30
M ft Pil Mass Div No. 20	

Sig.—One pill three times a day after meals

If seborrhea is present, it should be suitably treated by free use of soap and water and applications described under seborrheic dermatitis. If there is no evident pathologic process going on in the skin stimulating remedies may be employed. These usually contain quinine, alcohol, cantharides and ammonia water. A widely used proprietary medicine is bay rum

Psoriasis

It is a recurrent skin disease of unknown etiology, characterized by papular, reddish, scaly lesions on the elbow, knees, scalp and other regions of the body.

Treatment—Cortisone and ACTH cause disappearance of patches but relapses occur when the drugs are discontinued. Benefit is also reported from the use of aminopterin in doses of 1-2 mgm. daily. In one patient improvement was maintained for 5 months on a daily dose of 0 75 mgm. The drug is toxic and careful watch should be kept during treatment.

Local Measures—The most effective remedy is chrysarobin when it can be tolerated by the patient Treatment is commenced with an ointment containing 0 1 per cent of the drug and the strength is gradually increased to 5 per cent as tolerance increases. The patches should be scrubbed and the ointment well rubbed in. Chrysarobin should not be used for the head and the eyes should be protected as the drug gives rise to a severe conjunctivitis :

R Chrysarobin	...	dr. 1½
Lanolin		
Petrolatum āā	...	oz. 2

Sig.—Chrysarobin ointment.

A much safer preparation to use is a coal tar ointment

R Coal Tar	...	gr. 25
Zinc Oxide	...	gr. 50
Petrolatum	...	oz. 1

It should be applied every night till the lesions clear up Improved results are reported from the exposure of psoriatic areas to 1 erythema dose of the ultra-violet rays the next morning through a thin layer of the ointment. After the exposure Gockirman recommends that the patient should spend 2 hours in bath at 95°F. After this the ointment is again applied. Every other day autohemotherapy is given, the series of injections ending on the fifth treatment

On the scalp in place of coal tar ointment one containing 5 per cent ammoniated mercury and salicylic acid is used.

Lichen Planus

Lichen planus is a chronic skin disease characterized by intensely itching papules on the flexor surface of large joints and rarely in the mouth. The disease is self-limited but recurrences are common Nothing is known regarding the etiology

Internal treatment consists in the administration of hydrag perchloride in doses of 1/20 grain three times a day. Arsenic and bismuth have also been recommended Bismuth may be given intramuscularly once a week for 12 to 16 injections.

Local treatment consists of anti-pruritic lotion such as lead and tar lotion with or without the addition of 1 per cent phenol Irradiation with X-rays locally relieves the itching and also causes the eruption to disappear. X-ray exposures may also be made over the spine and sympathetic ganglia. The area of the spine exposed is that which gives rise to the nerves going to the area of the skin affected. The treatment should be given only by a skilled technician.

Rosacea

Rosacea is characterized by a tendency to capillary dilatation and a large red nose. It is almost invariably associated with one or more of the following: endocrine disorders, gastric indigestion and seborrhea of the scalp and face

Treatment—The general measures include avoidance of hot and highly spiced foods, alcohol, irritating soaps and exposure to environmental extremes. Indigestion should be suitably treated

Locally one of the following lotions may be applied

R Sulphur Precip	..	gr.	120
Zinc. Oxide	...	gr	240
Calamin	...	gr.	240
Glycer.	...	dr.	2
Aq ad.	.	fl oz	2
or			
R Potas. Sulphurat.	. .	dr	1
Zinc. Sulph.	.	dr	1
Aq. Ros ad.	...	fl oz.	1

Weekly fractional doses of X-rays as advocated for acne are useful for a speedy cure.

If permanent capillary dilatation is already present when the patient is first seen, the only useful measure is obliteration of the dilated vessels by diathermic coagulation.

Lupus Erythematosus

It is a chronic inflammatory disease of the skin with insidious development of small, pink, dry, maccular patches with grayish adherent scales and atrophic scars with gaping follicular orifices. The bridge of the nose and cheeks are the sites of predilection (butterfly distribution) The next most frequent site is the backs of the hands.

Local Therapy—Calamine lotion, lotio alba, tar and salicylic ointment, carbon dioxide snow, ultra-violet rays and X-rays have been recommended and used by different authorities. The results are not very encouraging

Gold—Gold sodium thiosulfate has been used intravenously once a week as in rheumatoid arthritis The doses are 10 mg, 20 mg, 50 mg and 100 mg The last dose is repeated weekly until a total of 1 G has been given. The treatment must be given under expert supervision and the drug stopped if any untoward reactions develop

Bismuth—Pilsbury (1942) recommends the use of weekly injections of bismuth as in syphilis In his opinion it is better than gold and safer. Gold should only be used if bismuth has first been tried and found wanting.

ACTH—It is the most effective agent and renders the use of gold and bismuth unnecessary.

Pemphigus

Pemphigus is a rare disease characterized by successive crops of bullæ of various sizes on apparently healthy or slightly reddened skin or on mucous membrane. Sooner or later constitutional symptoms develop and the disease ends fatally in a majority of the cases

Treatment is unsatisfactory Daily hot potassium permanganate baths are necessary for removing crusts and discharges from the raw area. Swabbing the affected parts with hydrogen peroxide or a ½ per cent solution of brilliant green in alcohol is useful When buccal mucosa is involved a mouth wash containing ½ per cent silver nitrate is recommended. When swabbing is difficult a 2 per cent solution of cocaine is applied before the meal. Arsenic in the form of Fowler's solution orally or neoarsphenamine intravenously gives relief in the early stages Other drugs from time to time advocated are quinine, tryparsamide, coagulin (Ciba) and salicyn. Blood transfusion have been reported with apparent success in a few cases. Recently ACTH and cortisone have been used but the results are temporary.

Dermatitis Exfoliativa

The disease may occur due to exposure of the skin to external irritants such as chrysarobin or sunlight, administration of internal irritants such as organic arsenicals, gold or mercury, a bacterial toxemia such as scarlatina, and disorders of the hemopoetic system such as Hodgkin's disease, lymphoid leukemia and mycosis fungoides. An idiopathic variety in which no cause can be discovered is also described.

Treatment—For pruritus a calamine or lead and tar lotion with or without phenol 1 per cent or menthol 2 per cent may be used For weeping a mild solution of aluminum subacetate acts as an astringent. For removing scabs gentle swabbing with olive oil or liquid petrolatum is indicated. The patient may be given sodium bicarbonate or bran baths for cleansing and comfort.

In exfoliative dermatitis due to heavy metals, intravenous injections of BAL and sodium thiosulfate daily have been recommended. Vitamin C in large doses may also be given.

Dermatitis Herpetiformis

It is a rare, chronic and recurrent skin disease of uncertain etiology, characterized by presence of grouped bullæ which may be angular, stellate, semi-circular or crescentic, and an intense pruritus. The sites of predilection are the neighbourhood of shoulder, elbow, lumbar region and knees Lesions may also occur in the buccal cavity

Treatment—Measures calculated to promote the general health are of value. Septic foci should be eradicated, bowels kept open and a high vitamin diet advised.

Arsenic given by mouth as Fowler's solution or intravenously in the form of organic arsenicals is of definite value

Potassium paraaminobenzoate (PAB) has been used with great success recently. The initial dosage is 18 to 24 G daily, the maintenance dose is 12 to 16 G daily.

Locally, anti-septic and anti-pruritic applications such as 1 per cent aqueous solution of gentian violet, calamine lotion or tar and lead lotion with or without 1 per cent phenol and an ointment such as the following may be used.

R Camphor	...	gr 6
Cold Cream	...	oz 1
or		
R Ichthammol	...	gr. 30
Zinc Oxid.		
Amylum āā	..	gr 120
Petrolatum	...	dr 4

Herpes Zoster

In the early stages pituitrin should be injected in doses of ½ to 1 c.c. once or twice daily. It both allays the pain and shortens the duration of the eruption. Other measures to relieve pain are the use of analgesics; aspirin, saridon, codeine or even morphine may be used. Locally the affected parts should be powdered with talcum and covered with a thick layer of cotton wool. When crusts have formed, a 2 per cent ammoniated mercury ointment should be applied. Chloromycetin has been used in the treatment of early cases and the reported results are very encouraging. It is of no use in the treatment of post-herpetic pain.

For the burning and neuritic pain that follows the disease, injections of thiamine are indicated.

Herpes zoster involving the conjunctivæ requires the use of frequent cold compresses and atropine drops.

Warts

The treatment of solitary warts is simple. Chromic acid 20 per cent, nitric acid full strength or trichloracetic acid may be applied with a glass rod. The surrounding skin should be protected with petrolatum.

When warts are multiple and recur, intramuscular injections of bismuth once weekly have been advocated. Orally bistrimate is recommended in doses of one tablet t.i.d. If no signs of intolerance appear 2 tablets t.i.d. should be ordered after food. Beckman advocates the use of nitrohydrochloric acid orally.

R Acid Nitrohydrochlor.	...	dr. 4
Aq. ad.	...	fl oz 4

Teaspoon in water after each meal.

CHAPTER XXVII

VENEREAL DISEASES

Syphilis

The treatment of syphilis has undergone a complete change after the introduction of penicillin and other antibiotics The advantages of penicillin over arsenic and heavy metals—ease of administration, lack of toxicity and a shorter duration of treatment—are definite.

Penicillin

Primary and Secondary Syphilis—For office or ambulatory treatment of syphilis an aqueous preparation containing 300,000 units of procaine penicillin G per ml is selected Two c c of this solution are injected intramuscularly into the buttock daily. The site of injection is not massaged and the activity of the patient is not restricted For seronegative syphilis 8 daily injections with a total of 4 8 million units and for seropositive primary syphilis 12 daily injections with a total of 7 2 million units are made. For secondary syphilis 16 injections (9 6 million units) and for early relapsing syphilis 20 daily injections (12 0 million units) are made If urticaria or angioneurotic edema occurs in the course of the treatment an anti-histaminic drug like benadryl, antistin or anthisan is given orally in doses of 50 mg two or three times daily, to control symptoms and permit completion of treatment.

After the completion of the treatment, careful physical examination and quantitative serological tests are made at monthly intervals during the first year, at three-monthly intervals during the second year and once yearly thereafter The C S fluid is examined between 6 and 12 months after the completion of the treatment.

Treatment of a Subsequent Relapse—A serologic relapse is manifested by a progressive rise in the titer of the quantitative serologic test after it has shown a falling trend or by a reversal of the test from negative to positive. A clinical relapse is manifested by a reappearance of symptoms and signs : skin and mucous membrane lesions, lymphadenitis, meningitis, iridocyclitis, neuroretinitis, periostitis, hepatitis and jaundice Asymptomatic neurosyphilis is considered either as a relapse or treatment failure and is discovered by an examination of the spinal fluid

If a patient who has received 4·8 million units of penicillin for seronegative primary syphilis and again 12 million units for early relapsing syphilis shows at any time after treatment evidence of a serologic or clinical relapse or of asymptomatic neurosyphilis, treatment is at once resumed. A second course of penicillin consisting of 12 0 million units is administered and followed by a 26-week arsenoxide-bismuth schedule

Weeks	Dichlorophenarsine Hydrochloride Intravenously	Bismuth Subsalicylate Intramuscularly
1—5	60 mg twice a week	0 2 Gm once a week
6—10	60 mg. twice a week	
11—16		0 2 Gm once a week
17—21	60 mg. twice a week	
22—26	60 mg twice a week	0 2 Gm once a week.

Early Latent Syphilis—History of infection of less than four years duration The serologic test is positive, the cerebrospinal fluid examination is negative for syphilis Treatment consists of 8 daily injections of 600,000 units of procaine penicillin G Follow-up is similar to that of primary and secondary syphilis If a relapse occurs 20 daily injections are given A second relapse is treated by 20 more daily injections followed by a course of arsenoxide and bismuth

Late Latent Syphilis—History of infection is of more than four years duration The serologic test is positive, the cerebrospinal examination is negative for syphilis The treatment recommended is the same as in a case of early latent syphilis After administration of penicillin to a patient with late latent syphilis a negative response in serologic tests need not be expected in all cases

Late Syphilis—There is recurrence of secondary lesions on the mucous membranes and/or skin in a patient who is untreated or has had inadequate treatment Dark ground and serologic tests are positive but spinal fluid examination is negative or positive. It usually occurs within first two years of the infection Treatment recommended is 10 daily injections of 600,000 units of procaine penicillin G If relapse occurs the penicillin course is repeated and followed by a course of arsenoxide and bismuth

The treatment of late cutaneous syphilis (gumma or noduloulcerative lesions of skin) consists of a course of 10 daily injections of repository penicillin In case of a relapse the course is repeated

Late osseous syphilis is rare Its manifestations are pain especially at night, local swelling, tenderness, stiffness of adjacent joints and roentgenologic changes. Treatment consists of 8 daily injections of 600,000 units of procaine penicillin G No treatment is necessary in patients with an infection of more than 30 years duration.

Late hepatic syphilis is also rare. Symptoms and signs vary and there may be none or any combination of slight icterus, ascites, low grade fever, anemia, epigastric pain and tenderness Spleen and liver may be enlarged. The blood test is usually positive and the spinal fluid test negative. To avoid a *Herxheimer* effect treatment is commenced with bismuth subsalicylate in oil 0 2 Gm

injected intramuscularly once a week for 12 injections This is followed by 10 daily injections of 600,000 units of procaine penicillin G If a relapse occurs penicillin course is repeated.

In late cardiovascular syphilis also Herxheimer effect is to be avoided and a course of bismuth injections is recommended before penicillin therapy. If cardiac failure is present, this should be treated first by rest, digitalis and other measures and anti-syphilitic therapy instituted only after the compensation has been restored.

Syphilis in Pregnancy—Procaine penicillin G 600,000 units daily for 10 days is recommended.

Congenital Syphilis—In early latent congenital syphilis 300,000 units of procaine penicillin G are recommended to be injected intramuscularly for 10 days; in late latent congenital syphilis the daily intramuscular dose is 600,000 units In cases of juvenile paresis 600,000 units of procain penicillin G are injected daily for 30 days A relapse is treated by a further course of the antibiotic Treatment of interstitial keratitis consists of 15 daily injections of 600,000 units of procaine penicillin and instillation of 1 per cent atropine drops twice daily in the eye Measures such as fever therapy or the use of arsenic or bismuth are considered not necessary. Spinal fluid tests are performed at intervals of six months to find out if activity is still present.

Neurosyphilis—The treatment of neurosyphilis of all types consists at the present time of 10 daily injections of 600,000 units of procaine penicillin No other measures such as fever therapy or the use of arsenic or bismuth are considered necessary.

Cerebrospinal fluid should be examined at six monthly intervals until all spinal fluid tests give normal values Pleocytosis should subside (6 or more cells per ml indicate activity), total proteins decline and colloidal gold and serological tests show improvement on quantitative determination

Other Antibiotics

Penicillin is to-day without doubt the drug of choice in the treatment of syphilis but under certain circumstances other antibiotics like chloromycetin, aureomycin and terramycin may be employed. All three have been found to be effective in seronegative and seropositive primary syphilis, secondary syphilis and late syphilis Aureomycin has been used recently in a large number of trials Its special value is in cases in which penicillin treatment is followed by severe reactions and in cases of syphilis which fail to respond to penicillin. Aureomycin is also recommended in cases of late syphilis in which Herxheimer reactions are undesirable. Kierland and O'learry (1950) recommend oral aureomycin in the treatment of neurosyphilis The dosage recommended is a priming dose of 2 Gm. followed 4 hours later by a second dose of 2 Gm. thereafter 1 Gm. every 4 hours till a total of 70 Gm. has been administered.

Toxic Reactions of Anti-syphilitic Drugs

Arsenicals :

The toxic effects of arsenic and their treatment is summarized in the following table.

NATURE OF REACTION	THERAPY
	Immediate
Nitritoid	Liq. adrenalin hydrochlor m. 4 subcutaneously before injection.
Vomiting	Slow injection
	Twelve Hours after First Injection
Fever, Headache	Bed, fluids
Herxheimer	Bed, fluids
Vomiting	Glucose before injection.
	In First Ten Days
Encephalopathy	Stop arsenic Lumbar puncture BAL
9th-day Erythema	Stop arsenic Change to penicillin
	Later
Neuritis	Thiamin. Liver Extract. BAL Change to penicillin
Dermatitis	Calamine lotion BAL Change to penicillin
Agranulocytosis	Blood transfusions Pentnucleotide BAL. Penicillin
Jaundice	Due mostly to syringe transmission of infective hepatitis Prevention by sterilization of syringe. If due to arsenic BAL Glucose Change to Penicillin

BAL is administered intramuscularly and the dose is 3 mg/kg body weight 4 times a day during the first 48 hours and thereafter morning and evening for ten days

Bismuth—Early signs of toxicity are stomatitis and a blue gum-line More serious toxic effects are malaise, loss of weight, diarrhea, albuminuria, dermatitis and jaundice

Penicillin—Toxic effects include allergic manifestations and a high incidence of Herxheimer reactions Caution is needed, therefore, in treatment of late syphilis by penicillin.

Aureomycin—The only toxic symptoms are nausea, vomiting and diarrhea The Herxheimer reactions are mild and less frequent The drug is therefore more suitable for treatment of late syphilis.

Gonorrhea

Acute Uncomplicated Gonorrhea—The drug of choice in the treatmen of acute uncomplicated gonorrhea both in the male and the female is penicilli Sulfonamides and antibiotics other than penicillin such as chloromycetin, aureo mycin and terramycin are also effective.

Sulfonamides—Sulfathiazole 1 Gm every 6 hours for 5 days is recommended From 30 to 40 per cent of the cases fail to respond.

Penicillin—The drug is recommended to be injected intramuscularly a crystalline penicillin is doses of 100,000 units every 3 hours for 5 doses or pro cain penicillin G aqueous in doses of 300,000 units at 12 hourly intervals fo 2 doses.

Other Antibiotics—Although penicillin is the drug of choice in the treatment of gonorrhea, other antibiotics may be employed when penicillin is contra-indicated due to hypersensitivity or fails to eradicate the infection. The dose of chloromycetin recommended is 3 Gm. daily in one dose for two days Both aureomycin and terramycin are effective in doses of 250 mg 4 times a day for 5 days

Tests of cure including clinical examinations, macroscopic inspection of the urine for threads and debris, microscopical examination of stained films of urethral and cervical secretions and of cultures of these secretions are required to make certain that the infection has been eradicated

As penicillin and other antibiotics may mask or delay the development of concomitantly acquired syphilis, it is advisable to make serologic and clinical examinations for syphilis at the second, third and sixth month after treatment.

Acute Complications

Acute Prostatitis—Bed rest, hot rectal normal saline douches, omnopon 1/6 grain if there is severe pain and penicillin 300,000 units of procaine penicillin twice daily for at least 3 days Daily for at least 3 days Daily catheterisation if retention

Acute Salpingitis—Bed rest, Fowler's position, omnopon, kaolin poultices and penicillin

Acute Epididymitis—Bed rest, kaolin poultices, support to the scrotum on a large pad of cotton wool, omnopon and penicillin

Periurethral and Bartholins Abscesses—Local applications of heat and penicillin If necessary, incision.

Arthritis—Rest in bed, fixation by sand bags, kaolin poultices or radiant heat, omnopon and procaine penicillin 600,000 units daily for at least six days In subacute or chronic arthritis good results may follow fever therapy by intravenous injections of T. A. B. vaccine (25 to 50 million organisms) twice weekly for 3 or 4 injections.

Iritis—Local instillation of atropine drops is combined with local and parenteral use of penicillin.

Chronic Gonorrhea—In males it is usually due to a chronic infection of the urethral follicles in the anterior urethra or to persistence of infection in the prostate or seminal vesicles, in females due to a chronic infection of the glands of the cervix. Persistent or relapsing gonorrhea in the male is sometimes due to the formation of a soft stricture at the site of chronically inflamed urethral follicles When this condition is present the treatment consists of dilatation with metal bougies combined with chemotherapy. Dilatation is performed once a week for 4-6 weeks and each dilatation is followed by an injection of 300,000 units of procaine penicillin G. Daily irrigations with potassium permanganate 1 · 8000 are also given.

Usually in the male the chronic infection is located in the prostate gland Treatment in this case is prostatic massage twice weekly followed each time by an intramuscular injection of 300,000 units of procaine penicillin Short courses of sulfathiazole or pyretotherapy may prove valuable in refractory and resistant cases.

Chronic cervicitis in women responds to therapy with repeated courses of penicillin and sulfanomides In resistant cases chloromycetin, aureomycin and terramycin may be employed in the dosage already advocated

Chancroid.

Ulcers respond to sulfadiazine 1 Gm every 6 hours for 7 days In refractory cases streptomycin or aureomycin should be employed Streptomycin is injected intramuscularly in 1 Gm doses every 6 hours for 5 days Aureomycin is given orally in doses of 500 mg every 6 hours for 10 days If buboes are present these should be aspirated and not incised, the aperture is dusted with sulfathiazole powder. When fusospirochetosis is present in the destructive form of chanchroid ulcers, penicillin therapy local and parenteral is indicated

Granuloma Inguinale

Treatment is by streptomycin 1 Gm. intramuscularly every 6 hours for 5 days or preferably by chloromycetin or aureomycin The dosage is 500 mg. every 6 hours for 10 to 14 days

Lymphogranuloma Inguinale

Of the antibiotics the most useful are Chloromycetin and aureomycin The dose is 500 mg. every 6 hours for 10 days for bubo and for 21 to 30 days when proctitis is present. Rectal stricture and elephantiasis require surgical intervention in addition to chemotherapy.

CHAPTER XXVIII

DISEASES OF THE NERVOUS SYSTEM

DISEASES OF PERIPHERAL NERVES

Neuritis

There are two varieties: an inflammatory or interstitial variety in which the disease is localized to one nerve or contiguous nerves of a plexus and a degenerative variety or polyneuritis in which peripheral parts of nerves are involved, the lesions being both multiple and symmetrical.

Polyneuritis

Polyneuritis may result from:

(*a*) Virus diseases. measles, small-pox, chicken pox, parotitis, herpes, landry's disease, poliomyelitis, encephalomyelitis, epidemic encephalitis and pink disease.

(*b*) Bacterial diseases: focal infections, rheumatic fever, erysipelas, septicemia, diphtheria, gonorrhea, typhoid fever, typhus, influenza, pneumonia, malaria, syphilis, relapsing fever.

(*c*) Deficiency or metabolic diseases: pellagra, pernicious anemia, sprue, beri-beri, alcoholic neuritis, hunger edema, pregnancy, chronic colitis, cancer or tuberculosis with cachexia, senility with cachexia, diabetes, myxedema, recurrent polyneuritis, chronic progressive polyneuritis, chronic bacillary dysentery.

(*d*) Chemical poisons: mercury, lead, silver, arsenic, phosphorus, methyl alcohol, carbon tetrachloride, trinitrotoluene, dinitrobenzene, aniline, barbital, chloral, carbon bisulphide, thallium, sulphur, gold, bismuth and emetine

Multiple neuritis is characterized by wide spread muscular weakness (wrist drop and foot drop) and sensory disorders, pain, muscle tenderness, numbness, tingling, etc., of peripheral segments of the limbs. The sphincters are not involved

Treatment—Any underlying disease present should be vigorously treated. If the cause is a chemical poison the patient should be removed from its influence. Bed rest should be enforced except in the mildest of cases. The legs or arms should be protected by wrapping in cotton wool. If this is not enough to relieve the pain, hot applications and analgesics should be prescribed If there is diaphragmatic and intercostal paralysis, a Drinker respirator is of value; failing this an oxygen tent may be used. Steps should be taken to prevent deformities by suitable positions and use of light splints. When there is still pain, massage, movements and electrotherapy are not to be used; later on they are useful adjuncts.

Thiamine—Thiamine requirements are increased during acute infections, bowel disturbances and ingestion of chemical poisons. It is now believed that

polyneuritis is a *thiamine* deficiency disease This vitamin should, therefore, be given in liberal amounts. At the commencement of treatment 50 mg daily (Berin, Binerva, Betalin S) should be given parenterally for a week, thereafter 10 mg daily by mouth until all symptoms disappear If other vitamins are also deficient they should be *supplied* The diet should be liberal and contain generous amounts of vitamin B, and other vitamins

Interstitial Neuritis

Interstitial neuritis affects either single nerves or contiguous nerves in a plexus The commonest varieties are cervico-occipital neuritis, brachial neuritis and sciatic neuritis Treatment is similar to that already described for fibrositis

1 *Cervico-occipital Neuritis*—Treatment consists of rest in bed, local applications of heat (electric pads, infra-red, short wave), analgesics and in refractory cases after anesthetization with 2 per cent procaine, an injection of alcohol into the occipital nerve

2. *Brachial Neuritis*—In the early stages immobilization in a sling provides rest to the affected part Immobilization should be continued so long as the pain is severe Local applications of heat and analgesic drugs are also of value during this If pain is still present after a week, gentle passive and active movements of the arms should be carried out thrice a day to prevent stiffness.

Massage should be avoided during the early stage Later on, however, and when fibrositis of the shoulder joint is associated with brachial neuritis, massage and movement are valuable During this stage physiotherapy (infra-red rays, short wave, and hydrotherapy) should be exploited to the best advantage. If after a fortnight of this treatment limitation of movement is still present, periarticular injection of ½ per cent procaine should be given and the joint manipulated Sometimes a general anesthetic is necessary to complete the manipulation Movements and massage should be continued for many days after this treatment

3. *Brachial Plexus Syndrome*—It is characterized by pain in the shoulder, muscular weakness in the shoulder and arms with atrophies and secondary changes and paralysis of the cervical sympathetic nerves The etiologic factors may be such varied conditions as trauma, cervical rib, scalenus anticus pressure and neoplasm of the cord, bone or lung (superior sulcus tumour). Symptoms develop after the patient has been lifting heavy weights or doing heavy work to which he or she is unaccustomed In many cases rest to the limb and heat and analgesics will relieve the condition If this is not the case operative interference should be considered

HERPES ZOSTER

Herpes zoster is due to an inflammatory lesion of the sensory spinal ganglia. It occurs as an acute infectious disease caused by a virus and as a secondary manifestation of spinal cord tumour, meningitis or local trauma Clinically there is a vesicular eruption along the course of one or more peripheral nerves, preceded, accompanied or followed by pain in the region

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bowel disturbances [illegible]

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Treatment—Chloromycetin 250 mg. every 4 hours by mouth is of value in the acute stage For relief of pain the following drugs have been recommended acid acetyl salicyl, phenacetin, saridon, codopyrin, in severe cases injections of post pit (½ to 1 c.c) morphine or cobra venom (5 mouse units daily). Roentgen ray irradiation over the spinal roots has proved effective in some cases

Later in the disease when post herpetic neuralgia is left behind injections *of thiamin* (B_1) *are of value.*

In herpes of the ophthalmic division of the fifth nerve great care must be taken to minimize corneal ulceration and subsequent opacity

TRIGEMINAL NEURALGIA

Septic foci in the teeth, tonsils and sinuses should be adequately dealt with Thiamine and nicotinic acid should be administered parenterally and by mouth in large doses In mild cases the following mixture may be useful

R Pot Brom	...	gr	10
Phenazon	...	gr	7
Tinct Gelsem.	...	mg	10
Aq ad	...	oz.	1

Three times a day.

Tricholorethylene 20 to 30 drops inhaled from a piece *of gauze brings* relief from attacks and may be used 4 or 5 times during the course of the day

In the past, trigeminal neuralgia used to be treated by injection of 80 per cent alcohol The supra- and the infra-orbital nerves were treated by inserting a needle in their foramina The sensory roots and gasserian ganglion were approached by a very difficult route and during the procedure the physician was absolutely in the dark as to where his needle was going More recently it has been possible to control the position of the needle by use of X-rays

The procedure of choice to-day is a retroganglion neurectomy The operation is performed under a local anesthetic and with the patient in the sitting position After resecting the fifth nerve, the face is devoid of superficial sensation of all qualities in an area *extending into the external auricular* canal Deep facial pressure and pressure pain are undisturbed and taste remains normal Recently Dandy has suggested a posterior approach to the trigeminal root, *contending that if he cuts the root close* to the pons, tactile sensibility will be spared His work, however, is not confirmed by Van Nonhuys who showed that the root fibres were intimately mixed and that a *selective division of pain bearing fibres was impossible.*

Atypical neuralgia is not infrequent and is not relieved by removal of foci of infection, alcohol injection or root resection It occurs earlier in life in the third decade. It is usually constant and difficult to describe. It is dull, aching, drawing, throbbing and deep. The pain is relieved by aspirin and heat and aggravated by cold and fatigue The pain is probably psychogenic in origin and care should be taken to differentiate it from pain of organic nature

FACIAL PALSY

The affected side of the face should be kept warm by covering it with cotton wool. A nourishing diet rich in vitamin B_1 should be given. As the disease is now believed to be due to deficiency of thiamine, this vitamin should be given in large doses parenterally and by mouth Recovery is invariable.

Treatment by electrotherapy is not recommended as it may lead to facial contracture

When facial paralysis is caused by disease of, or operation on the ear, the prognosis is not so good.

TINNITUS

Wax should be removed. Phenobarbitone or bromides may be given Prostigmine (Roche) 1 tablet three times a day has been given with benefit in a few cases

VERTIGO

The treatment should be directed toward removing the cause Phenobarbitone ½ grain three times a day or sodium salicylate 10 grains combined with sodium bromide 10 grains may be given three times a day for long periods Recently potassium chloride 75 grains morning and evening has been recommended A salt-poor diet may also be of benefit The author has found prostigmine (Roche) and the following mixture highly successful

R Liq Trinitrini	m. 1
Liq. Strychnine	m. 3
Tinct. Gelsemium	m. 10
Sod Bromid.	gr 10
Aq. ad.	fl oz 1 t i d

TRAUMA OF THE CENTRAL NERVOUS SYSTEM

Cord Injuries

The treatment is not very successful The dislocation must be handled gently to avoid cord injuries that have not yet occurred The treatment of hematomyelia is directed entirely to the lesion of the vertebra if such exists. Usually immobilization, plaster cast and later braces suffice Pia-arachnoid hemorrhages are of little significance, as they usually clear up *Fractures of the vertebrae, without cord damage, are treated by rest and appropriate* appliances. When deformity appears open operation may be *performed.*

When injury to the cord has occurred Brain and Strauss offer the following indications for laminectomy :

1 Radiographic evidence of bony deformity or foreign bodies, such as missiles, in the presence of signs that conductivity of the cord is not completely abolished

2 An undue delay or arrest of recovery of spinal function when the lesion is incomplete.

3 The occurrence of severe, persistent root pains.

Laminectomy is contra-indicated in the presence of sepsis, in the presence of visceral complications and when the cord lesion is complete.

For the incurable lesion, the duration of life is short Care of the bladder should be exercised by use of an in-dwelling catheter. Hot water bottles should be avoided to prevent burns The skin must be carefully looked after for decubitus ulcus In partial lesions, orthopedic devices may assist in some reconstruction of the patient and exercise may develop his remaining functioning muscles

HEAD INJURIES

The cranium and its contents are extremely liable to injury in modern times with so many automobiles Fractures of the cranium do not give us much concern unless they are associated with simultaneous injury to the brain, coexisting hemorrhage or subsequent pressure from protruding bone fragments Linear fractures of the vertex are, in themselves harmless and heal spontaneously in a short time. Fractures of the base of the skull are associated much more frequently with cerebral complications often of a serious nature. Courville divides the clinical stages after head injuries into those of shock, reaction, irritation, recovery, and/or complication

Shock of a generalized nature constitutes the most important syndrome in acute brain injuries The skin is cold and clammy, the pulse rapid, the temperature subnormal and the blood pressure lowered. Simple stupor or severe coma may be present. After the shock has passed off, the patient may sit up and vomit in a reaction The reaction stage is followed by irritation during which the patient may become restless and hyperactive following which progressive recovery ensues or after a lucid interval complications set in As a result of trauma edema or hyperemia may appear alone or in association with laceration and hemorrhage During this stage there is severe headache (evidenced by groans even in stuporose state) and the blood pressure tends to rise There may even be vomiting Retinal vessels become hyperemic and dilated but papilledema seldom occurs unless there is a dural hemorrhage Frequent readings of blood pressure should be taken in cases of head injuries as rise in pressure is the most reliable sign of cerebral edema

Treatment—The first thing to do in case of head injuries is to treat the shock. This consist of rest, quiet, warmth and general stimulating measures When the patient is unconscious he should be turned half over on his face to prevent aspiration of blood and nasal secretion into the lungs A neurological examination should be made soon after and at intervals after the injury. The pulse, the respiratory rate, the temperature and the blood pressure should be recorded hourly An assessment of the state of consciousness should be made If the patient does not become progressively more conscious and the coma deepens, a complication should be suspected, which may require surgical intervention. Surgical treatment of head injuries is not required except when a depressed fracture of the skull is present or large extradural and subdural hemorrhages cause a dangerous increase of intracranial pressure. The slightly raised intracranial pressure which often follows head injuries is of value in [illegible] especially from torn venous sinuses and is not an

indication for reducing the intracranial pressure In the early stages of an head injury, therefore, vigorous measures to reduce intracranial pressure are not advocated. For the first two or three days treatment should be entirely conservative unless a complication is present. Rest in bed in a quiet room is of the utmost importance During the stages of irritation sedatives may be required The most useful drug is sodium luminal and 3 to 5 grains may be injected intravenously. Paraldehyde per rectum is recommended by Hamilton Bailey. Morphine must not be used After the first two or three days when it is desirable to reduce the intracranial pressure the following measures may be adopted:

1. *Lumbar Puncture*—C S F. should be withdrawn slowly and cautiously as a sudden release of pressure may cause herniation of the cerebellum into the foramen magnum. Not more than 5 to 10 c c of the fluid should be withdrawn at a time The procedure may be repeated after 24 hours

2 Intravenous injections of hypertonic saline, sucrose or five-times concentrated serum.

3. *Magnesium Sulphate per Rectum*—Three ounces of the salt is dissolved in six ounces of water and run slowly into the rectum

Rest in bed should be continued till pain in the head is completely relieved Return to active life should be by slow stages

Post-Concussion Syndrome

The most prominent symptom is headache Dizziness and fatigue are next in importance to the headache Nervous irritability, personality changes, defective memory, anxiety neurosis and melancholy states are not infrequent

Treatment consists of complete rest, sedatives, and in refractory cases therapeutic encaphalography In not a few cases recovery is delayed by matters pertaining to compensation or future employment Treatment in a special rehabilitation centre, is of value in these cases

LATE MANIFESTATIONS OF CRANIO-CEREBRAL INJURIES

These are:

1. Post-traumatic, purulent leptomeningitis
2 Brain abscess
3 Massive cerebral hemorrhage (rarely)
4 Post-traumatic epilepsy.

Frequently trauma is followed by development of convulsive seizures several months or even several years after injury. Treatment by extirpation of cortical scars is not successful

VASCULAR LESIONS OF THE BRAIN

Cerebral Hemorrhage.

The disease usually occurs between the ages of 40 and 60 years. Males are affected more commonly than females A familial tendency to vascular

degeneration is often present. The commonest predisposing causes are chronic nephritis and high blood pressure, the commonest exciting factors emotion and muscular strain. Hemorrhage may be intracerebral (commonest site is internal capsule), meningeal (extra or sub-dural) and intraventricular.

Characteristic symptoms are:

(*a*) Initially unconsciousness or coma and (*b*) paralysis

Diagnosis has to be made from thrombosis, embolism and other causes of coma (diabetes, sun stroke, malaria, uremia, alcoholic intoxication, trauma, etc.).

Treatment—This is most unsatisfactory. The patient is put to bed and the head somewhat raised If the respiration is impeded he should be turned on the side and the mouth frequently cleaned The neck should be free and not bent An ice cap should be applied to the head and hot water bottles to the feet. Alcohol or stimulants should not be given. Unless cerebral thrombosis is suspected attempts to reduce cerebral pressure by intravenous use of concentrated glucose may be of distinct benefit. Liquid food may be administered by the nasal tube. Eight to ten ounces of blood may be removed once in those who are plethoric and have cyanosis, distended cervical veins, a full tense pulse and stertorous respiration. Venesection is contra-indicated in anemic individuals and those with small weak pulse. A purgative should be given and in comatose individuals a suitable one is a minim of croton oil in butter placed at the back of the tongue Great care is needed to prevent bed sores, and regular catheterization may be necessary until consciousness is regained. If recovery ensues the residual paralysis may require treatment by re-education, massage, movement and electricity.

Rutin and vitamin C are valuable agents as prophylactics among those who have hypertension and increased capillary fragillity.

Subarachnoid Hemorrhage

This is usually due to a leaking congenital aneurism. The leak may be related to a sudden increase in blood pressure, as in plunging in to cold water, lifting a weight or straining at stool. The characteristic symptoms are a headache of rapid onset, coma of varying degree, blood in the C. S. F. and a stiff neck.

Treatment—The patient should be kept quiet in bed for at least a month As the blood pressure is normal, the value of venesection is doubtful Morphine is not advised, codeine should be used in adequate dosage. The intravenous use of glucose (100 c c of a 25 per cent solution) is repeated at 6 or 8 hours intervals to relieve the headache. Slow withdrawal of C. S. F. is valuable. It should be frequently repeated.

Epidural and Subdural Hemorrhages

These are usually due to trauma and the treatment is surgical

CEREBRAL THROMBOSIS AND EMBOLISM

The patient is put to bed and the foot of the bed is raised about 9 inches Purgation and venesection should be avoided Stimulants such as strychnine

and coramine may be employed Some authorities recommend the use of nitroglycerin and alcohol

In those with syphilitic etiology, anti-syphilitic treatment should be commenced

The treatment of residual paralysis is similar to that of hemiplegia due to hemorrhage.

HYPERTENSIVE ENCEPHALOPATHY

The syndrome is associated with hypertension Prodromal symptoms such as headache, vomiting, apathy and weakness are sometimes present In some cases the condition is ushered in, by a general convulsion Various transient disturbances, hemiparesis, hemianopia or aphasia develop Hypertensive retinitis is present

Treatment—In mild attacks sedatives by mouth (phenobarbitone 1 grain) and rectal mag sulph (1 ounce in six ounces of water) is all that may be required In severe cases hypertonic solution (70 c c of 15 per cent sodi chlor or 50 per cent glucose) may be injected intravenously In plethoric individuals blood-letting is of value

CEREBRAL ATHEROSCLEROSIS

The symptoms are extremely variable Mental symptoms are numerous and always present Memory for recent events is poor There are serious changes in disposition and personality The patient becomes irritable and easily upset by slight matters He may cry or laugh at slight provocation Gradual deterioration leads to a state of dementia Vertiginous attacks and epileptiform seizures seem a frequent occurrence Small aneurismal dilatations or atheromatous ulcers may allow small amounts of blood to pass through into the subarachnoid space

Treatment—Rest, adequate nursing and forbearance on the part of the younger members toward the whims and humours of the patient will be helpful. Sedatives may produce an increase in the mental symptoms and should not be given

ATROPHIES

Under this heading are considered a variety of conditions with abnormalities of muscle metabolism or the metabolism of their nerves and central connections

PROGRESSIVE MUSCULAR ATROPHY

Several well-known types occur depending upon the site of the lesion:

1. The lower motor, spinal or Aran-duchenne type
2. The Amyotrophic lateral sclerosis
3. Progressive bulbar paralysis.
4. Progressive ophthalmoplegia.

Treatment is unsatisfactory Septic foci if present should be eradicated Attention should be paid to general health and tonics prescribed. A slowly progressive form with positive W. R is amenable to anti-syphilitic treatment Recently vitamin B_1 and E have been recommended but the beneficial results claimed have not been confirmed

MUSCULAR DYSTROPHY

There are several varieties, the commonest being pseudohypertrophic muscular dystrophy.

Treatment—Treatment is unavailing Glycine has been recommended in doses of half ounce twice daily; while it does not effect a clinical improvement, it decreases the creatinuria Recently, pyridoxine (vitamin B_6) 80 mg weekly by hypodermic injection has been suggested as a controlling measure Wheat germ oil (Vitamin E) 15 minims, three times a day has also been recommended

MYOTONIA

Myotonia congenita and myotonia atrophica are characterized by an inability to relax the contracted muscles In the latter condition dystrophy also exists and there is general wasting and testicular atrophy In the families of the patients cataract frequently occurs.

Treatment—Quinine sulphate 10 grains three times a day effectively controls myotonia Epinephrine and calcium injections have also been advocated

MYASTHENIA GRAVIS

Treatment consists in a restful life with avoidance of fatigue The diet should be adequate and attention paid to general health

Remarkable results have been obtained in the treatment of this disease by the use of neostigmine The drug is usually given by mouth in doses of 15 to 30 mg 4 to 6 times a day It may be combined each time with 1/200 grain of atropine to diminish the unpleasant side effects In emergencies or for diagnostic purposes prostigmine 0 5 mg may be given parenterally Its routine use by this route is, however, not recommended

Guanidine hydrochloride 10 to 30 mg per kilo body weight, divided into 4 to 6 doses and given by mouth, has been reported to give valuable results Ephedrine $\frac{3}{8}$ grain morning and evening, orally is also of value

Recently Burgen has introduced tetraethylpyrophosphate (TEPP) in doses of 4 to 6 mg twice daily

Surgery—In a number of cases tumours of the thymus have been found associated with myasthenia and their removal has led to permanent cure Thymectomy is advisable only in severe cases that do not respond to prostigmine. An alternative treatment is deep X-ray therapy of the thymus

FAMILIAL PERIODIC PARALYSIS

In this disease the patient wakes up in the morning and finds himse paralysed The treatment consists in administration of large doses of potassiu chloride 5 to 10 G by mouth

DISEASES OF THE SPINAL CORD

MYELITIS

Myelitis may be idiopathic, syphilitic, due to compression, trauma, specific fevers, tumours or meningitis of the cord or acute poliomyelitis It may be (a) transverse myelitis or (b) acute ascending or diffuse myelitis The symptoms depend upon the level of the cord involved

Treatment—During the acute stage the patient is kept on a water bed or a special rubber mattress Bed sores should be prevented by a scrupulous care of the skin The bladder should be regularly catheterized and measures taken to prevent cystitis Bowels should be regulated and daily enemata given if necessary. After the acute stage, *i e*, 10 to 14 days the patient should be encouraged to move his limbs Massage is of value Contractures should e prevented by suitable position and orthopedic devices

COMPRESSION OF THE SPINAL CORD

The commonest cause is Pott's disease or tuberculous caries Other causes are syphilis, tumour, pachymeningitis fracture-dislocation of the spine, spondylitis deformans, and Hodgkin's disease

Treatment is that of the cause The treatment of tuberculous caries has been dealt with under another section

TUMOURS OF THE SPINAL CORD

Tumours of the cord may be extramedullary or intramedullary The ptoms depend upon the site of the tumour The diagnosis should be made n other causes of compression of the Cord Valuable aids in diagnosis are graphy after injection of lipiodol, Quecken-stedt's test and the presence oin's syndrome

Treatment is surgical

SYRINGOMYELIA

is a chronic disease of the spinal cord characterized pathologically by th of neuroglia near the central canal and presence of a cavity and by dissociated anesthesia, trophic changes in skin, joints and other d muscular atrophy and motor changes Spastic paraplegia is common on is sometime found associated with a cervical rib.

sis has to be made from hematomyelia, intramedullary tumours, eprosy, hysterical anesthesia, progressive muscular atrophy and

Treatment—Anesthetic parts should be protected from burns and injuries. Deep X-ray therapy often proves of benefit. It should be applied to the site of disease and the treatment repeated once a year.

HEMATOMYELIA

It may occur as a result of trauma, or it may occur spontaneously as in anemia, hemophilia or violent muscular exertion It may also occur into areas of myelitis or syringomyelia.

Symptoms are identical with those of syringomyelia Diagnosis is made by the fact that in syringomyelia the condition progresses, in hematomyelia symptoms improve

Treatment consists of absolute rest, extension of the spine, application of ice bag and general care as in myelitis

LANDRY'S PARALYSIS

Landry's ascending paralysis is not the name of a disease, but constitutes a syndrome caused by a number of pathological entities The usual cause of the syndrome is an ascending form of anterior poliomyelitis. It may also be seen in post-vaccinial or post-erythematous myelitis or acute polyneuritis

Treatment—Lumbar puncture should be made to relieve the increased tension of the C. S. fluid Prostigmine (Roche) and atropine should be given parenterally in combination Pyridoxine hydrochloride (50 mg doses) may also be tried.

When the respiratory muscles are affected the patient should be put in a Drinker respirator and hypodermic injections of strychnine grain 1/60 given four hourly Oxygen inhalation and nasal feeding may also be required.

DISSEMINATE SCLEROSIS

Disseminate sclerosis is a disease of young adults characterized pathologically by scattered areas of sclerosis throughout brain and cord, and clinically by spastic paraplegia, nystagmus, intention tremor and scanning speech The course is characteristically prolonged and remissions are a feature.

Treatment—There is no available treatment. Rest, good food, fresh air, massage and movement are all that one can offer. Arsenic has been used but with no benefit Strychnine and electricity are contraindicated. Recently thiamine has been used but the results are doubtful Stone recommends intraspinal injection of pyridoxine hydrochloride in 50 mg doses at weekly intervals.

SUBACUTE COMBINED DEGENERATION

It is a disease associated with pernicious anemia and characterized by sensory and motor symptoms due to combined degeneration of posterior and lateral columns of the cord Numbness, tingling and spastic paraplegia, later followed by a flaccid paraplegia are associated with a characteristic blood picture:

Treatment—This consists in the administration of hydrochloric acid by mouth, large doses of liver, vitamin B_{12} and thiamine chloride parenterally

PARKINSONISM

Parkinsonism may occur in young people as a result of encephalitis or in old age due to arteriosclerotic disease In either case the site of disease is in the basal ganglia and striatal regions of the brain The important symptoms are a mask-like expression, a characteristic attitude and gait, termors and rigidity.

Treatment—Drugs of the belladonna group are used alone or in combination with amphetamine It is customary to begin with small doses of strammonium, 8 minims of the tincture t d s and gradually increase the dose to 30 minims t d s Extracts of root of bulgarian belladonna (bella-bulgara nd rabellon) have been used and superior results claimed for them These are, however, not confirmed

Another useful drug used in combination with belladonna is amphetamine t is more useful in the encephalitic form of the disease than in the arterio-lerotic form The dose is 10 mg before breakfast and lunch

Several new drugs are being investigated at present, and the results appear to be encouraging Among these are: oranixon, tolserol, parpanit, myanesin and artane

CHOREA

Sydenham's Chorea

It is a rheumatic manifestation Children suffering from Sydenham's chorea ould be examined carefully for evidence of carditis Treatment consists complete rest in bed, an ample diet and administration of sodium salicylate aspirin Pyridoxine hydrochloride intraspinally in 50 mg doses at weekly rvals may be tried.

EPILEPSY

diopathic epilepsy consists of major attacks (grand mal) minor attack mal) and epileptic equivalents

atment—Attention to general health is of great importance Swimming, and other similar exercises or occupations which entail danger should lden Marriage should be discouraged as the disease is often hereditary should be forbidden Diet should be adequate and should contain nounts of vitamins. Ketogenic diets with high fat and low carbohy- protein content have been advocated

—The drugs employed are bromides, phenobarbitone and in refractory n diphenyl hydantoinate (dilantin, epanutin) The most important ould be borne in mind with regard to the use of the sedatives is ould be used long enough (for 2 years after the last fit) and regularly bromides is from 30 to 60 grains daily for adults. Bromides when ng periods may give rise to obstinate acne, mental depression and

loss of appetite. Phenobarbitone is used in doses of 1 to 1½ grains twice daily for adults Proportionate doses should be used for children. In *refractory* cases epanutin (adult dose 1½ grains t d s) should be used. The sedative action of the drug is not pronounced but the anti-convulsant properties are marked When administering epanutin, the bromide or phenobarbital should not be suddenly stopped, its dose should be gradually reduced till it is finally replaced completely by epanutin. Most authorities consider epanutin or dilantin sodium as the drug par excellence in the treatment of epilepsy. It is given in ½ to 1 grain dose morning and evening If necessary, three doses may be given in the day. Most cases are controlled by about 3 grains per day but as much as 4½ to 6 grains *may be given without serious danger. If excessive gum hypertrophy occurs* after its use, the drug should be gradually replaced by mesantoin

In petit mal and psychomotor attacks a valuable drug is the newest of anti-epileptics—tridione The dose is 0 32 to 0 64 G. t i.d.

Treatment of an Attack—A spoon covered with cotton wool should be placed between the teeth to prevent injury to the tongue. It is impossible to shorten an attack and after one is over the patient should be left in a quiet room to sleep.

Status Epilepticus—In this condition convulsions occur rapidly one after the other. The treatment consists of an injection of paraldehyde 2 c.c or amytal sodium or phenobarbital sodium (7½ to 15 gr.) I.V., or failing this chloroform inhalation.

NARCOLEPSY, CATAPLEXY

Treatment—Benzedrine sulphate in doses of 10 mg. before breakfast and again before lunch gives good results Ephedrine in ½ grain doses twice daily is also effective but less so than benzedrine

MIGRAINE

Migraine is a disease characterized by periodic attacks of headache, usually with nausea, and often preceded by disorders of vision Very frequently there is a hereditary background.

Treatment—The presence of any organic cause for the headache, such as malaria, sinusitis or errors of refraction, should be ascertained and appropriate treatment instituted. Attention should be paid to general health and hygiene, and constipation should be corrected. Precipitating factors such as fatigue, worry and overwork should be eliminated. Patients should do less work and have more rest and physical and mental calm. A vegetarian diet with minimum fats and proteins, is recommended. *Carbohydrates should be taken liberally.* The fluid intake should be generous During an attack the patient should lie quietly in a darkened room A large dose of an analgesic at the onset of the attack is often beneficial Aspirin, phenacetin, saridon, veramon are suitable preparations A valuable drug that will abort attacks is ergotamine tartarate. It may be used parenterally (0.5 mg.). D. H. E is said to have fewer side effects It is sold as gynergen or femergen tablets. The same dose may be repeated in one to two

hours, if no relief has been obtained. The drug should not be given more oft than once or twice a week, and in pregnant women Treatment of migran and resistant cephalalgia with procaine aerosol (0 05-0 1 G of 1 per cent solution and ergotamine tartrate aerosol (0 05-0 1 mgm) has been recommended by Tabart (1950).

Treatment for Prevention of Attacks—The measures recommended are.

1 *Desensitization by Peptone or Histamine*—Butler and Thomas (1945) report on the intravenous use of histamine in 34 patients with excellent results Cases treated were those of idiopathic or "pure" migraine Dose of histamine was 1 mg. histamine as 2 75 mg of histamine acid phosphate in 500 c c of normal saline, the injection being made extremely slowly (5 drops per min. increased according to tolerance). The time taken over the injection varies from 4-8 hours Three or four treatments are given on alternate days Blood pressure readings are taken hourly and a decided drop is an indication for cessation of treatment Development of headache, tachycardia, urticaria or asthma during treatment is an indication for slowing the rate of injection If heart burn ensues, antacids are recommended to be administered The treatment is contraindicated in peptic ulcer and vascular disease

2 More recently benadryl 50 mg orally has been used with success Kapseals benadryl are put on the market by P D & Co

3 Phenobarbitone ½ grain b i d

4 The use of Gower's mixture over long periods of time

℞ Liq Trinitrini	m	1
Liq. Strychnini	m	5
Tr. Gelsemii	m	10
Sod. Bromid.	gr	10
Aq. ad.	fl oz	1

5 Nicotinic acid is given orally in doses of 90 mg daily, thiamine is given intravenously in doses of 30 mg daily for 2 weeks, then 30 mg three times a week for 2 weeks and finally 1 to 2 times a week for 2 months.

6 Use of estrogens

7. Carbachol 1 tablet t i d.

8 *Riboflavine*—Riboflavine is recommended in doses of 5 mg t i d. This should be continued for several months If during the course of this reatment prodromal symptoms appear they are usually relieved by taking o mg riboflavine hourly until symptoms subside (5 or 6 doses) C. B Smith (1946) reports 5 cases in which therapy could be discontinued after a few months. In others it had to be continued indefinitely. Discontinuation was followed by recurrence.

9. *Prostigmine Bromide*—I. J. Patton (1946) reports successful treatment with this drug A 15 mg. tablet is dissolved in 1 oz. of water. The patient takes this solution three times a day beginning with 1 drop and increasing each successive dose by 1 drop, until the dosage is 10 drops three times a day This dosage is continued for 1 week. A maintenance dosage of 10 drops twice a week is then instituted; if signs of impending headache are noted, an additional 15 to 20 drops is taken.

Miniere's Disease

Miniere's disease is characterized by recurring attacks of dizziness, tinnitus, deafness and nausea, and is due to disorder of the endolymph system in the labyrinth of the inner ear

Treatment—Furstenberg recommended a treatment designed to decrease local edema in the labyrinths. His original treatment has now been modified by Talbot and Brown The fluids should be limited to 800 c c. (1½ pints) a day, mersalyl injections (½ c c intravenously) given twice weekly and potassium chloride given by mouth in daily doses of 6 to 10 G.

Recently Atkinson has suggested that there are two types of the disease, one allergic which is reproducible by injection of histamine and controlled by desensitization with it, and the other constrictive and controlled by injections of nicotinic acid and thiamine. Histamine treatment has been discussed elsewhere

In refractory cases and as a last resort, section of the vestibular nerv may be considered.

APPENDICES

APPENDIX I

COMMON POISONS AND THEIR TREATMENT

Acute poisoning is characterized by two sets of symptoms. At first there are manifestations of gastro-intestinal irritation such as burning in the mouth and epigastrium, vomiting, abdominal pain and diarrhea. Later after absorption of the drug there is collapse with faintness, pallor or cyanosis, low blood pressure, feeble pulse and finally coma often interrupted by convulsions Chronic poisoning, on the other hand, gives rise to many and diverse combinations of symptoms. The manifestations of chronic poisoning include anemia, neuritis, dysentery, tremors, marasmus, nephritis and visceral degeneration

In acute poisoning treatment consists of

i Removal of the poison

ii. Neutralization.

iii Supportive measures

In chronic poisoning therapy involves ridding the body slowly enough to prevent acute poisoning and special supportive measures according to indication

Removal of the Poison—If swallowed this is removed by use of a stomach tube or an emetic. For that part which has reached the bowel, a purgative will be required.

Gastric Lavage—The technic of gastric lavage has been described earlier. Stomach lavage may be dangerous in poisoning by corrosives as the tube may cause perforation of an eroded gullet or stomach In poisoning by other agents, however, lavage is generally more effective than emesis, since its action is immediate and antidotes may be introduced in large amounts

Emetics—Emetics may be used in place of a stomach tube The following are commonly used :

i Powdered mustard 1 dram in a tumbler of water

ii Common salt 4 drams in a tumbler of water.

iii Copper sulphate 50 to 100 c c of a 1 per cent solution.

iv Zinc sulphate 50 to 100 c c. of a 1 per cent solution

v. Apomorphine hydrochlor grain 1/8 hypodermically

Purgatives—Quick result is obtained by use of 1½ ounces of magnesium sulphate in a glass of warm water

Neutralization of the Poison—Neutralization of the poison should be attempted concurrently with its removal The common methods of neutralization are·

1 *Dilution*—Water warm or cold is drunk
2 *Adsorption*—Powdered wood charcoal is administered in a dose of 6 drams
3 *Protection*—The protectives to the mucous membranes usually employed are milk 500 c c ; egg white 4 ounces, olive oil 4 ounces; milk of magnesia 2 ounces
4 *Oxidation*—Pot permang 500 c c. (1 pint) of a 1 in 1,000 solution.
5 *Protein Precipitation*—This is accomplished by letting the patient drink 1 pint of strong tea or ½ pint of 1 per cent solution of tannin

A universal antidote with adsorptive, demulcent and precipitative properties is one like the following

R Wood charcoal	ounce 1½
Magnesium oxide	dram 6
Tannic acid	dram 6

Sig—Teaspoon in a tumbler of warm water.

Supportive Treatment—If there is depression or collapse, stimulants such as aromatic spirit of ammonia (30 minims in water) are indicated, caffeine sodium benzoate 7½ grains or coramine may be given hypodermically. Heat should be applied externally and physiological salt solution or dextrose (5 per cent) injected intravenously Artificial respiration should be instituted if there is cessation of breathing and adrenaline (1 in 1,000) 15 minims are injected into the heart if it stops

If the patient is excited or in convulsions, sedatives are indicated Among the common ones are chloral-hydrate 10 grains or sodium amytal 3 grains orally, morphine ¼ grain hypodermically and avertin per rectum (3/8 to ¾ grain per pound of body weight).

ACEATANILID ANTIPYRINE: AMINOPYRINE

(Phenacetin, Pyramidon, Aspirin, Headache cures)

ACUTE POISONING

Symptoms—Vomiting, cyanosis especially of the face; collapse with cold skin, profuse sweating; feeble pulse and slow breathing; sometimes a rash simulating measles, scarlatina or pemphigus.

Treatment—Gastric lavage with 1 pint of 1 in 1,000 potassium permanganate, or emesis; external heat; caffeine sodium benzoate 7½ grains hypodermically, 5 per cent dextrose (1 pint) intravenously; carbon dioxide-oxygen inhalation; artificial respiration if required.

CHRONIC POISONING

Acute methemoglobinemia (acetanilid) causing cyanosis, dyspnea; agranulo-cytosis following amino-pyrine

Treatment—Withdraw the drug completely Blood transfusion for anemia and methemoglobinemia General hygiene and dietary measures If agranulocytosis, blood transfusion, penicillin and pentnucleotide

ACID CARBOLIC

(Lysol, creosote)

Characteristic odor of breath; whitened lips and mouth, burning pain from mouth to stomach which may become dulled from local anesthetic action, pupils contracted, body cold and clammy, temperature subnormal, pulse feeble; stomach contracted and rigid, reflexes abolished; urine black on standing

Treatment—Stomach may be washed out with a solution of magnesium or sodium sulphate ½ ounce to the pint or an emetic may be given Stimulant if necessary, milk, egg albumin or other demulcents, hot water bottles, artificial respiration

ACIDS INORGANIC

Symptoms—Lips, mouth and tongue burned, pain in digestive tract, intense thirst; dysphagia, nausea and vomiting, pulse rapid and feeble, clammy skin; respiration shallow and difficult, collapse, convulsions possible

Treatment—Do not use stomach tube or emetics Administer magnesia, lime water; soap solution; followed by milk, egg albumin, olive oil, barely water. Morphine hypodermically for pain

ACID HYDROCYANIC

(Cyanides; cherry laurel water, bitter almond oil)

Characteristic odor of bitter almonds, respiration rapid and vigorous, becoming slow and gasping, slow imperceptible pulse, glassy protruding eyes; dilated pupils, convulsions; limbs flaccid, skin clammy and cold; mouth may be covered with foam, frequently blood stained

Treatment—Immediate action is imperative Stomach tube, cold douche to the head and spine; artificial respiration, inhalation of amyl nitrite or smelling salts; brandy and other stimulants internally, ether subcutaneously, half ounce of tincture of perchloride of iron in a wine glass of water followed by a teaspoonful of magnesium carbonate which may be repeated if necessary

With large doses death is almost instantaneous and little can be done.

Neutralization of the Poison—Neutralization of the poison should be attempted concurrently with its removal The common methods of neutralization are:

1 *Dilution*—Water warm or cold is drunk
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ACID CARBOLIC

(Lysol, creosote)

Characteristic odor of breath; whitened lips and mouth; burning pain from mouth to stomach which may become dulled from local anesthetic action; pupils contracted; body cold and clammy, temperature subnormal, pulse feeble; stomach contracted and rigid, reflexes abolished, urine black on standing

Treatment—Stomach may be washed out with a solution of magnesium or sodium sulphate ½ ounce to the pint or an emetic may be given Stimulant if necessary, milk, egg albumin or other demulcents, hot water bottles, artificial respiration

ACIDS INORGANIC

Symptoms—Lips, mouth and tongue burned, pain in digestive tract, intense thirst; dysphagia; nausea and vomiting, pulse rapid and feeble, clammy skin, respiration shallow and difficult, collapse, convulsions possible

Treatment—Do not use stomach tube or emetics Administer magnesia; lime water; soap solution; followed by milk, egg albumin, olive oil, barely water Morphine hypodermically for pain

ACID HYDROCYANIC

(Cyanides; cherry laurel water, bitter almond oil)

Characteristic odor of bitter almonds, respiration rapid and vigorous, becoming slow and gasping; slow imperceptible pulse, glassy protruding eyes; dilated pupils; convulsions, limbs flaccid, skin clammy and cold; mouth may be covered with foam, frequently blood stained

Treatment—Immediate action is imperative Stomach tube, cold douche to the head and spine, artificial respiration, inhalation of amyl nitrite or smelling salts, brandy and other stimulants internally; ether subcutaneously, half ounce of tincture of perchloride of iron in a wine glass of water followed by a teaspoonful of magnesium carbonate which may be repeated if necessary.

With large doses death is almost instantaneous and little can be done If the patient survives for 30 minutes recovery is likely

ACID OXALIC (OXALATES)

Severe pain in throat and stomach; dysphagia; intense thirst; muscular weakness; vomiting (frequently of bright or dark blood); skin clammy and

cyanosed; respiration rapid and labored; pulse feeble and fluttering, dilated pupils, collapse; convulsions

Treatment—Give magnesia, lime water or a soluble magnesium or calcium salt with a small quantity of water and in mild cases follow with stomach tube; thereafter magnesium sulphate or castor oil; milk and demulcents; stimulants; external heat. Where a concentrated dose has been taken causing deep corrosion of the mucosa (indicated by severe burning pain and collapse) the stomach tube must not be employed. Treatment is continued on the same lines as for mild cases

ALKALIES (CAUSTIC)

(Caustic potash, caustic soda, strong ammonia)

Pain in mouth, throat and abdomen; lips and tongue swollen; mucou surfaces first whitened then brownish vomiting, diarrhea; skin cold an clammy, pulse rapid and weak; shock

Treatment—Do not use stomach tube or emetics; give diluted vinega or lemon juice or solutions of citric and tartaric acids to neutralize the alkali Follow with milk, olive oil, egg albumin, stimulants; morphine ¼ grain fo pain; heat to extremities

ANTIMONY (Tartar emetic)

Acute Poisoning—Burning heat and constriction or choking in throat; severe pain in abdomen, thirst; nausea, violent vomiting; purging; cramps in calves, urine scanty or suppressed; pulse at first rapid then slow and imperceptible, skin cold, clammy and cyanotic; profuse perspiration, delirium; paralysis and coma

Treatment—Encourage vomiting by rapid draughts of tepid water. If it has not begun use stomach tube or give emetic. Give tannic acid grain 30 in water repeated until cessation of vomiting. Thereafter give milk, egg albumin; respiratory and circulatory stimulants; morphine to relieve pain; external heat; oxygen or artificial respiration as required

ARSENIC COMPOUNDS

(Weed killer, sheep dip; horticultural sprays, Fowler's solution)

Acute Poisoning—Burning pain in esophagus and stomach, intense thirst; vomiting (often blood stained), profuse diarrhea; urine scanty or suppressed; cramps; cold clammy skin; cyanosis; pulse small, frequent and feeble; collapse; convulsions.

Treatment—Use stomach tube or emetic; give ferric hydroxide freshly prepared by diluting 1½ ounces of ferric chloride solution with a wine glass of water and adding the resulting solution to ½ ounce of sodium carbonate in half a tumbler of water. 10 to 20 c c. of a 10 per cent solution of sodium thiosulphate intravenously; milk, eggs, barley, water, olive oil; stimulants; ice for thirst; glucose saline intravenously; heat; morphine for pain.

ALCOHOL

Acute Poisoning—Ataxia, confusion, decreased respiration, coma, abolition of superficial and deep reflexes.

Treatment—Gastric lavage, external heat; strong coffee; caffeine sodium benzoate 7½ grains subcutaneously.

ANESTHETICS VOLATILE

(Nitrous oxide, ethylene, ether, chloroform)

Deepened unconsciousness, tachycardia, abolition of reflexes, stoppage of heart and respiration

Treatment—Withdrawal of anesthetic, prolonged artificial respiration; oxygen-carbon dioxide inhalation, caffeine sodium benzoate (7½ grains) subcutaneously, metrazol intramuscularly Epinephrine, 1 c c of 1 in 1,000 solution intracardially, if heart has stopped.

ASPIDIUM

Diarrhea; dizziness, headache; muscle cramps, later liver and kidney damage, jaundice and albuminuria

Treatment—Emesis, magnesium sulphate 1½ ounces in water, caffeine and sodium benzoate 7½ grains subcutaneously.

BARBITURATES

(Barbitone, phenobarbitone, hexobarbitone, etc.)

Mental confusion, giddiness, delirium, coma, marked fall in blood pressure; depression of respiration, temperature may fall or increase, pupils moderately dilated; absence of corneal reflex, suppression of urine, constipation, skin rashes possible

Treatment—Gastric lavage or emetic, lumbar puncture; stimulants; intravenous glucose saline, catheter or enema as required, *artificial respiration*, if necessary; external heat

Three to 10 c c. of 1 · 1,000 picrotoxin solution intravenously every 10 minutes until spontaneous muscular movements occur *Thereafter* repeated injections at greater intervals to retain signs of stimulation

Strychnine gr. 1/8 repeated every 2 hours until signs of recovery occur may be used in place of picrotoxin.

In chronic barbiturate poisoning there are general depression, anorexia, cachexia, gastro-intestinal disturbances, dyspnea on exertion; hypothermia; skin eruptions; volubility in speech; vertigo; defective memory, lack of concentration; tremors; increased reflexes.

Treatment—Remove the suspected drug; control excitation by another sedative if necessary (paraldehyde); improve the patient's hygiene and nutrition.

BELLADONNA

(Datura, atropine, hyoscine)

Dryness of mouth and throat, great thirst, hoarseness of voice; dilated pupils (double vision), skin flushed and dry; skin eruptions possible; temperature raised, rapid bounding pulse, breathing slow and stertorous; purging, scanty urine, delirium

Treatment—Use stomach tube or emetic. Give tannic acid. gr 20 in water, pilocarpine nitrate gr $\frac{1}{3}$ repeated every 2 hours until mouth is moist; morphine grain $\frac{1}{8}$ to $\frac{1}{4}$ cautiously (not in hyoscine poisoning) or barbiturates; stimulants, hot coffee, external heat, catheterize if urine retained; artificial respiration if required

BORIC ACID AND BORATES (BORAX)

Gastro-intestinal irritation, epigastric pain, abdominal cramps; vomiting, diarrhea, collapse with weak pulse, clammy skin, pallor or cyanosis.

Treatment—External heat, gastric lavage; caffeine sodium benzoate $7\frac{1}{2}$ grains hypodermically, sodium bicarbonate 5 to 10 c c. daily to render urine alkaline

BROMIDES

(Bromoseltzers, three bromides, nerve medicines, epilepsy cures)

Depression, anorexia, cachexia, vertigo, skin rash; psychosis; delirium and excitation with blood bromide over 150 mg per 100 c c. Excitatory symptoms may occur at 50 or 100 mg per 100 c c

Treatment—Stop bromides and other sedatives, force fluids to 4 quarts daily, administer sodium chloride 1 to 3 drams a day; stomach may be aspirated to remove hydrobromic acid continuously, hydrotherapy; soft diet Adrenal cortical extract 5 c c hypodermically

CAMPHOR

Characteristic odor of breath, flushed face; gastric pain; vertigo; collapse and convulsions, coma

Treatment—Apomorphine hydrochloride 8 mg. subcutaneously; gastric lavage with warm water, external heat; caffeine and sodium benzoate ($7\frac{1}{2}$ grains) hypodermically, sodium amytal grains 3 to $7\frac{1}{2}$ for convulsions intramuscularly, artificial respiration if necessary

CARBON MONOXIDE

Dizziness; weakness; dyspnea, unconsciousness, collapse; cyanosis

Treatment—Carbon dioxide-oxygen inhalation (initiated when necessary by artificial respiration), caffeine sodium benzoate ($7\frac{1}{2}$ grains) subcutaneously. Blood transfusion, if necessary.

CARBON TETRACHLORIDE AND TETRACHLORETHYLENE

(Cleaning fluids, dry shampoos, fire extinguishers, hookworm remedies)

Headache; persistent nausea, hepatitis and later jaundice, anemia; oliguria; collapse, coma.

Treatment—Fresh air when the poison has been inhaled, gastric lavage with 1 in 1,000 potassium permanganate when it has been swallowed, caffeine sodium benzoate 7½ grains subcutaneously; artificial respiration, if necessary, later high carbohydrate diet and dextrose 5 per cent solution intravenously, steam inhalation for bronchitis; calcium gluconate

CHINIOFON

(Enterovioform, yatren, diodoquin and other oxyquinoline derivatives)

Jaundice usually after prolonged therapy

Treatment—Stop the drug; give dextrose intravenously; high carbohydrate diet

CINCHOPHEN AND NEOCINCHOPHEN

(Gout and Rheumatism remedies, atophan)

Tinnitus; vertigo; deafness, nausea and vomiting, collapse.

Treatment—Gastric lavage with potassium permanganate 1 in 1,000 solution, caffeine and sodium benzoate 7½ grains subcutaneously, magnesium sulfate 1½ ounces.

In subacute poisoning there are anorexia, cachexia, nausea, vomiting, persistent abdominal pain, diarrhea, jaundice, liver tenderness, dark urine, stupor, collapse and coma.

Treatment—Stop drug High carbohydrate diet, dextrose intravenously, sodium bicarbonate by mouth.

COCAINE: PROCAINE: BUTYN AND OTHER LOCAL ANESTHETICS

Acute Poisoning—Excitement, anxi [illegible] ...pnea, tachycardia, convulsions and apnea [illegible] is pronounced with laughter, vertigo and [illegible]

Treatment—Gastric lavage with a quart of 1 in 1,000 potassium permanganate (if poison is swallowed) or tannic acid 5 Gm sodium luminal or sodium amytal intramuscularly.

For injected local anesthetic, ligate part if possible and inject amytal sodium intravenously (3 grains)

COPPER SALTS

(Blue Vitriol)

Salivation, vomiting (blue-green); diarrhea sometimes bloody; giddiness; headache; rapid pulse; shallow rapid respiration; skin cold and clammy; suppression of urine; delirium; convulsions; coma.

Treatment—Milk and eggs in large quantities followed by gastric lavage; demulcents like milk, egg white; opium or morphine for pain; external heat; artificial respiration and catheterization as required.

DIGITALIS

Headache; giddiness; abdominal pain; vomiting (green); purging; suppression of urine; salivation; muscular weakness; disordered vision; pupils dilated; pulse slow and irregular; delirium; lethargy; convulsions, coma

Treatment—Gastric lavage preferably with tannic acid or an emetic; stimulants; warmth to extremities; artificial respiration and catheterization as required

Recumbent position to be maintained for several days after improvement

DINITROPHENOL

(Obesity or Reducing Cures)

Feeling of heat, fever upto 111°F, sweating, rapid and deep respiration death with early onset of rigor mortis; yellow color of the skin.

Treatment—Copious gastric lavage with 1 in 1,000 potassium permanganate solution; ice-cold bath; cold water by mouth; dextrose 5 per cent solution 2 pints intravenously, caffeine and sodium benzoate 7½ grains subcutaneously for collapse; oxygen inhalation for cyanosis

EMETINE

Vomiting, marked gastro-enteritis; cardiac depression; collapse.

Treatment—Rest, stimulation with caffeine and sodium benzoate (7½ grains)

ERGOT

(Ergotamine tartarate or Gynergen)

Pallor, small pulse, cyanosis of extremities, gangrene, sensory disturbances, hallucinations

Treatment—Gastric lavage with 1 in 1,000 potassium permanganate; pilocarpine; 25 mg of mecholyl or 30 mg of papaverine subcutaneously; external warmth.

In chronic poisoning withdraw drug, protect extremities from temperature and trauma.

FOOD POISONING

Allergy—Malaise, gastro-intestinal disturbances, urticaria asthma, etc

Treatment is that of allergic condition. Epinephrin, purgative, 10 c c. of 10 per cent calcium thiosulphate intravenously

Botulism—Dizziness, blurring of vision; diplopia, photophobia, lachrymation; dry throat and mouth; muscular weakness and incoordination, constipation; mental faculties unaffected; temperature and pulse rate normal, gastro-intestinal symptoms usually absent

Treatment—Botulinus antitoxin, morphine, purgatives, posterior pituitary extract to relieve intestinal atony, stimulants

Salmonella Infections—Headache, abdominal pain, nausea, vomiting, diarrhea; slight increase in temperature, muscle weakness, collapse; prostration

Treatment—Stomach lavage with warm solution of sodium bicarbonate, castor oil; sulphonamides, arromatic powder of chalk, glucose saline intravenously; stimulants

Poisonous Fungi—(Toadstools) Headache, thirst, vomiting, violent purging; colic; slow weak pulse, respiration stertorous, pupils dilated, extremities cold; anuria and convulsions possible

Treatment—Gastric lavage (preferably with tannic acid) or an emetic, castor oil; stimulants, external heat, morphine subcutaneously for pain; atropine sulphate subcutaneously or tincture of belladonna by mouth, oxygen if required

GASOLINE OR KEROSINE

Burning mouth; vomiting, diarrhea, restlessness, incoordination; pneumonia if poison is aspirated.

Treatment—Gastric lavage with olive oil, oxygen and carbon dioxide inhalation.

GOLD

(Sanocrysin, Myocrisin)

Fever, vomiting, diarrhea, shock, later stomatitis and papular and vesicular rashes; agranulocytosis, albuminuria and renal damage

Treatment—Bal; sodium thiosulfate intravenously, ascorbic acid intravenously; glucose saline intravenously, pentnucleotide and penicillin for agranulocytosis; calamine lotion for dermatitis

IODINE

Metallic taste; pain and burning in mouth to stomach, vomiting (yellow or brown if starch is present in the stomach); purging (stools may be bloody)

intense thirst; cold and clammy skin; cyanosis; small frequent pulse; giddiness, faintness; convulsions; coma

Treatment—Use stomach tube or emetic; give frequent draughts of starch; rice or barley water; sodium bicarbonate or sodium thiosulphate in water; demulcents; stimulants; morphine to relieve pain; external heat; intravenous saline

LEAD

Acute Poisoning—Sweetish metallic taste; dry throat; thirst; abdominal colic; constipation; dark faces; vertigo; stupor; convulsions; coma

Treatment—Lavage with magnesium or sodium sulphate followed by lavage with plain water or emetics followed by ½ ounce of magnesium or sodium sulphate in water, demulcents; stimulants; morphine; external heat.

Chronic Poisoning—Loss of weight; anorexia; indigestion; abdominal colic; constipation, anemia with stippling, blue line (gums); cramps in extremities; muscular atrophy, headache, dimness of vision, optic neuritis, convulsions, lead encephalitis, hypertension; albuminuria; lead in urine.

Treatment—Remove source of poisoning, promote deposition of lead in bones by high calcium diet, calcium chloride 15 c.c. of 10 per cent solution intravenously for acute pain, later, mobilize calcium chloride for excretion of lead by producing mild acidosis with ammonium chloride 2 Gm. t i d.; sodium citrate in 2 to 4 Gm. daily doses, lead encephalopathy in children may be an indication for decompression of brain.

MERCURY COMPOUNDS

(Corrosive sublimate, white precipitate, vermillion cinnabar)

Acute Poisoning—Metallic taste, burning pain in mouth, throat and stomach; choking sensation, vomiting; purging (watery stools containing coagulated mucous membrane and blood); temperature subnormal; pulse rapid, irregular, feeble; skin cold and clammy; acute kidney inflammation; urine scanty or suppressed.

Treatment—Gastric lavage after giving large quantities of egg white in milk. At the conclusion leave some egg white in the stomach; the stomach should be emptied again after a few hours and once more later.

Give tincture of opium or morphine for pain, demulcents; stimulants

Sodium thiosulphate intravenously in poisoning by corrosive sublimate.

On the termination of acute symptoms a careful watch must be kept on 24 hour urinary output so that the possible onset of anuria is anticipated.

Other mercurials like calomel, etc., may give rise to spongy gums salivation, etc. The treatment consists in the use of mouth washes and administration of sodium thiosulphate and ascorbic acid parenterally.

Poisoning by mercurial diuretics like salyrgan, neptal, etc., has also been reported. Intravenous use of mercurial diuretics has been known to be followed by death. These drugs must not be injected intravenously. Treatment is on eliminative lines. Bal. is said to be of great value.

NICOTINE

Burning sensation in mouth, throat and stomach; salivation, mental confusion; muscular weakness; giddiness, vomiting, cold clammy skin, pulse slow then rapid, sighing respirations, convulsions, coma.

Treatment—Gastric lavage with tannic acid or emetics, hypodermic of strychnine; stimulants; external heat, artificial respiration, oxygen.

OPIUM

(Laudanum, morphine, codeine, heroin, chlorodyne, etc.)

Preliminary mental excitement followed by headache, dizziness, pinpoint pupils; skin cold and clammy, face cyanosed; muscular relaxation, pulse slow and feeble; respirations slow and shallow, temperature subnormal, coma; convulsions possible in later stages.

Treatment—Rouse patient and keep awake by walking, flagellation, cold douches; gastric lavage with 1 in 1,000 solution of potassium permanganate; black coffee by mouth; caffeine sodium benzoate, external heat; artificial respiration; carbon dioxide-oxygen inhalation.

PLASMOCHIN (PAMAQUIN)

Jaundice from hepatitis, dizziness, drowsiness, cyanosis from methemoglobinemia.

Treatment—Stop drug; methylene blue 50 c.c. of 1 per cent in 1.8 per cent sodium sulphate solution intravenously for methemoglobinemia.

PHOSPHORUS

Garlic taste; vomiting of blood, abdominal pain, thirst, jaundice; after 3 days malaise, prostration, twitching, coma, death.

Treatment—Gastric lavage with 1 per cent copper sulphate solution followed by 1 in 1,000 solution of potassium permanganate and then the administration of 100 c.c. of liquid petrolatum. External heat; later high carbohydrate diet; 1 quart of 5 per cent dextrose solution intravenously twice a day. Avoid fats or oils in diet.

PILOCARPINE PROSTIGMINE: NEOSTIGMINE

Epigastric pain; nausea, vomiting; delirium; collapse; cyanosis; anuria; jaundice.

Treatment—Gastric lavage with physiological salt solution, egg white, milk, external heat; methylene blue 50 c.c. of a 1 per cent solution in 1.8 per cent sodium sulphate intravenously; caffeine and sodium benzoate (7½ grams)

subcutaneously, artificial respiration; carbon-dioxide-oxygen inhalation blood transfusion if necessary. Later treat severe cases for degenerative nephritis.

QUINACRINE

Yellow color of the skin, nausea; vomiting, psychosis; insomnia; coma.

Treatment—Withdraw drug, general hygienic and supportive measures; sedation with a barbiturate; or paraldehyde, if required.

QUININE AND QUINIDINE

Tinnitus, disturbed vision; difficulty of speech; dizziness, vomiting; delirium, coma, later deafness and blindness, sometimes convulsions

Treatment—Gastric lavage with 1 in 1,000 solution of potassium permanganate or 1 per cent solution of tannic acid; epinephrine hydrochloride 1 c.c of 1 in 1,000 solution intracardially if necessary; caffeine and sodium benzoate grains 7½ subcutaneously; phenobarbitone for excitement; sodium nitrate 1½ grains in 100 c c. of distilled water intravenously repeated at 4 hour intervals for 3 or more doses.

SALICYLATES

Tinnitus, faintness, nausea, vomiting; disturbed vision; deafness; sweating; increased respiration, collapse; cyanosis; coma, delirium; sometimes convulsions, late renal damage with albuminuria; acetone odor on breath

Treatment—Gastric lavage with 1 in 1,000 solution of potassium permanganate, external heat, caffeine sodium benzoate subcutaneously; barbital for excitement, sodium bicarbonate 5 per cent solution intravenously for acidosis after methyl salicylate.

SANTONIN

Abdominal pain, yellow vision; convulsions; coma.

Treatment—Emesis; purgation with magnesium sulphate 1 ounce; keep patient warm; caffeine sodium benzoate (grains 7½) subcutaneously.

SNAKE BITE

Snake venoms are composed mainly of two constituents, a hemotoxin and a neurotoxin; the former destroys red blood cells and tissues while the latter, which has a curare-like action, attacks the nerve centres, particularly the sympathetic system. The venoms of different types of snakes contain varying proportions of each, the extremes being shown by Viper and Cobra

Viper Bite—Principally hemotoxin. Immediate swelling and discoloration; oozing of blood from mouth and conjunctiva; frequently vomiting of bloody material; coma; death in 6-12 hours

Cobra Bite—Principally neurotoxin; slow moderate swelling, little or no discoloration; paralysis of respiratory and vasomotor centre, asphyxia

Treatment—Ligature the part above the bite, make deep criss-cross incisions over the bite; suction mechanically or by mouth—rinse mouth with permanganate of potash solution first—cover bite with wet dressing, repeat suction for 15 minutes every hour for several hours, specific antivenine subcutaneously or in urgent cases intravenously The injection into or around of ½ per cent solution of potassium permanganate has been recommended but may cause destruction of tissue

Give fluids by mouth, rectum or intravenously, inject adrenaline, nikethamide, etc.; artificial respiration, blood transfusions

SULFONAMIDES

Nausea; vomiting; dizziness, ataxia, collapse, cyanosis (methemoglobinemia); agranulocytosis, jaundice, urinary tract irritation and anuria, urticaria; fever.

Treatment—Withdraw drug. Gastric lavage with 1 in 1,000 solution of potassium permanganate; physiological salt solution intravenously in large amounts; sodium bicarbonate 2 to 6 Gm daily, methylene blue 50 c.c of 1 per cent solution in 1.8 per cent sodium sulphate intravenously for cyanosis, retrograde flushing of kidney pelvis with physiological salt solution *for anuria*, blood transfusion for severe anemia, pentnucleotide for agranulocytosis

STRYCHNINE (NUX VOMICA)

Feeling of suffocation; cyanosis, sweating, convulsions, opisthotonus consciousness retained.

Treatment—Wood charcoal 6 drams by mouth, gastric lavage with 1 in 1,000 solution of potassium permanganate For convulsions sodium amytal intramuscularly (5 grains) or general anesthesia, artificial respiration *if needed*. Keep in a quiet, darkened room.

SULPHUR DIOXIDE

(Insecticide, Food Preservative)

Irritation of the upper respiratory tract; dyspnea, cyanosis, convulsions

Treatment—Remove from fumes, warmth, carbon dioxide-oxygen inhalation; physiological salt solution parenterally

WAR GASES

War gases may be sprayed or blown by wind or distributed in shells, grenades or with explosives.

Lacrimators: Chloracetone—Profuse lacrimation, smarting and burning of the eyes; blurred vision; blindness. Panicky effect, not dangerous.

Treatment—Wash eyes with 2 per cent sodium bicarbonate solution. Expose to a breeze; no bandages to eyes. Dark glasses.

Pulmonary Irritants (Phosgene, Chlorpicrin.)—Broncho-spasm, dyspnea; anoxemia, intense cyanosis, vomiting; acidosis; unconsciousness; collapse insidious; dangerous.

Treatment—Bed rest, warmth; oxygen; venesection; morphine for restlessness; sodium bicarbonate (1 pint of a 5 per cent solution) intravenously; caffeine and sodium benzoate 7½ grains subcutaneously; epinephrine 1 in 1,000 solution ½ c.c for bronchospasm.

Sensory Irritants (Diphenylchlorarsine)—Violent sneezing, nausea and vomiting; cough, dyspnea, pulmonary irritation and edema Not dangerous unless very severe

Treatment—Wash nose and mouth with 2 per cent sodium bicarbonate or physiological salt solution, rest; oxygen if necessary.

Vesicants (Mustard Gas, Lewisite)—Itching, blisters, dermatitis, blurred vision; sneezing; blindness; incapacity; collapse; shock. Increasing severity dangerous Lewisite, late arsenical shock.

Treatment—Wash eyes with physiological salt solution containing 2 per cent sodium bicarbonate, instil 1 per cent tetracaine for pain if necessary.

Mustard on Skin—Rub in chlorinated lime as paste made with equal parts of water, or wipe with azochloramid in triacetin, or sodium hopochlorite solution diluted with equal parts of water, wash skin with 1 to 5 per cent sodium bicarbonate solution, then soap and water. Splashed areas may be carefully spot-sponged with alcohol or gasoline, but avoid spreading; benzyl alcohol 3 per cent in alcohol may be applied for itching

Lewisite on Skin—Wipe with sodium hypochlorite solution and alcohol, then wash with soap and water Apply hydrogen peroxide or azochloramide in triacetin Drain blisters to remove arsenic. Treat blisters as burns. Bed rest; warmth, caffeiene and sodium benzoate 7½ grains subcutaneously Later treat for lung irritation and for collapse and shock, if necessary. Decontamination of all clothes and articles; handle with aid of heavy (autopsy) rubber gloves.

COMMON LABORATORY METHODS

I BLOOD

Hemoglobin Estimation (Sahli).

Place 20 cu mm. of blood from the pipet into the graduated tube which contains tenth-normal hydrochloric acid upto the mark '10' and shake to mix. Dilute with tenth-normal hydrochloric acid until the solution matches the standard The figure opposite the top of the column of solution denotes the percentage of hemoglobin.

Normal for men 85 to 110

Normal for women 75 to 100.

Over 65 per cent is mild anemia, 50 to 65 per cent is moderate anemia, under 50 per cent is severe anemia

Leucocyte Count.

1. Draw blood upto 0 5. Dilute with 2 per cent acetic to "II" mark.

2 Use low power and closed diaphragm Count all cells in 4 corner squares, each made of 16 small squares and multiply the total by 50.

Red Cell Count.

1 Draw blood to 0.5 Dilute with Hayem's fluid to 101

2 Use the high dry lens. Count 5 large squares bounded by double lines, each including 16 small squares Add 4 zeros to total for number of cells per cu. mm Normal 4 to 6 million

Normal count for men 4.7 to 6 1 million

Normal count for women 4 3 to 5 3 million

Counts of 3 5 to 4 million—mild anemia

Counts of 2 5 to 3 5 million—moderate anemia.

Counts below 2 5 million—severe anemia

Blood Smear.

Place a small drop of blood near one end of a glass slide. Spread it out with the end of a cover glass or another slide The smear should not be too thin

Routine Stain—Alcoholic eosin, one to two minutes. Wash. Hematoxylin 2 to 5 minutes. Wash.

The rate is increased in acute inflammation, active chronic inflammation such as tuberculosis, rheumatism, etc., malignancy and the last 4 months of pregnancy.

Blood Coagulation Time.

With a small syringe puncture a vein at the elbow and collect 1 c c of blood. Note the time. Remove the needle from the syringe. Transfer blood to a clean test tube freshly rinsed with physiological saline and having a diameter of 8 millimetres. Set the tube upright in a rack, at room temperature. At *half minute intervals tilt the tube to see if the blood still flows As soon as it* fails to flow and can be inverted, coagulation has taken place. The interval between the time when the blood was removed from the vein and the time when the tube could be inverted, is the coagulation time

Normal 2 to 8 minutes.

Bleeding Time.

Puncture the tube of the ear or the finger so that the blood flows drop by drop without any assistance Note the time the first drop appears Remove each drop as it forms with filter paper, care being taken not to touch the skin. Note the time bleeding stops. The time interval between the appearnce of the first drop and the removal of the last represents the bleeding time. Normally it is 2 to 3 minutes

Interpretation—The bleeding time is prolonged in hemorrhage of the new-born, thrombopenic purpura and in advanced acute leukemia The coagulation time is more frequently prolonged in hemorrhagic disease of the new-born, than is the bleeding time. The coagulation time is only slightly prolonged in thrombopenic purpura in contrast to prolonged bleeding time. In hemophilia the coagulation time is over 30 minutes while the bleeding time from a small incision is normal because the tissue juice from the margin of the incision supplies the blood deficiencies enabling a clot to form

Blood Culture.

Wash thoroughly with hot water and soap the skin at the bend of the arm. *Cleanse with alcohol and apply a wet dressing of* 1 : 1,000 bichloride of mercury for half an hour. Apply the tourniquet, remove gauze and apply tincture of iodine over a prominent vein. Ask the patient to keep hand clenched. Avoid touching the skin at the site of the puncture with the hand. If necessary to palpate the vein wear sterile rubber gloves or cover finger with sterile gauze. Withdraw 10 to 15 c c of blood in a sterile 20 c.c. syringe with a 20 gauge needle.

1. Inoculate a flask of 150 c.c. of glucose (0.2 per cent) hormone broth (pH 7.4 to 7.6) with 5 or preferably 10 c c. of blood The Kracke heart-brain broth is also recommended Other media may be used depending upon the infection suspected.

2. Place 5 c.c of blood in a test tube carrying sterile sodium citrate and rtoate thoroughly to prevent coagulation. (These tubes are prepared by placing 2 c c. of a sterile 10 per cent solution of sodium citrate in distilled water

in each Place in incubator or water bath until evaporated to dryness Replace cotton with boiled rubber stoppers Each tube will contain 0 3 Gm. sodium citrate sufficient for 5 c.c blood.)

3. In the laboratory culture the citrated blood as follows: (a) Melt 2 tubes of plain or glucose agar in a water bath and cool to 42° C, (b) To one add 1 c.c. of citrated blood and to the second 2 c c with a sterile pipette, (c) Pour into 2 sterile petri dishes and mix thoroughly, label each plate with amount of blood used; (d) Allow to harden and incubate covers down

4 Incubate the flask and plates for 48 hours when a preliminary report should be made. With great care against contamination, prepare a smear of the supernatant broth and stain by the method of Gram At the same time subculture about 0 5 c.c. of the sedimented blood and broth on a slant of blood agar. Repeat every 2 or 3 days for 10 to 21 days if there is no growth before rendering a final report If growths develop identify the organism If a growth appears in plates, report the number of colonies per c c of blood

Blood Urea (Mercury Combining Method)

1. To 7 c.c. of 10 per cent trichloracetic acid in a graduated centrifuge tube add 7 c c. of oxalated blood, a few drops at a time, shaking between each addition.

2 Centrifuge at high speed for 5 minutes Pipette off 5 c c of clear supernatant fluid.

3. To this add 5 per cent bichloride of mercury until saturation occurs Excess bichloride gives a faint brown color when added to saturated solution of sodium carbonate. 1 5 c c. bichloride may be used at once for the normal blood urea If a drop of mixture added to sodium carbonate on a white plate does not show brown in three seconds add 0 25 c c of bichloride Mix and test with sodium carbonate. Repeat until color appears

4. Multiply cubic centimeters of 5 per cent bichloride used by 40 and subtract 60 to obtain mg. of urea per 100 c c of blood

Normal 20 to 40 mg

Urea nitrogen = ½ urea

Blood urea is raised in chronic renal disease, in prostatic or other urologic obstruction and in intestinal obstruction and dehydration

Blood Sugar (Folin-WU)

1. Add 2 c.c. of oxalated blood to 14 c c of distilled water Add 2 c c. [illegible] 10 per ce[illegible] acid, a fe[illegible] be chocolate-brown Filter

2 In a Folin sugar tube marked "unknown" place 2 c c. of filtrate In another marked standard place 2 c c standard containing 0 2 mg dextrose.

The rate is increased in acute inflammation, active chronic inflammation such as tuberculosis, rheumatism, etc., malignancy and the last 4 months of pregnancy

Blood Coagulation Time.

With a small syringe puncture a vein at the elbow and collect 1 c.c. of blood. Note the time Remove the needle from the syringe Transfer blood to a clean test tube freshly rinsed with physiological saline and having a diameter of 8 millimetres. Set the tube upright in a rack, at room temperature. At half minute intervals tilt the tube to see if the blood still flows As soon as it fails to flow and can be inverted, coagulation has taken place. The interval between the time when the blood was removed from the vein and the time when the tube could be inverted, is the coagulation time.

Normal 2 to 8 minutes

Bleeding Time.

Puncture the tube of the ear or the finger so that the blood flows drop by drop without any assistance Note the time the first drop appears Remove each drop as it forms with filter paper, care being taken not to touch the skin. Note the time bleeding stops The time interval between the appearnce of the first drop and the removal of the last represents the bleeding time. Normally it is 2 to 3 minutes

Interpretation—The bleeding time is prolonged in hemorrhage of the new-born, thrombopenic purpura and in advanced acute leukemia. The coagulation time is more frequently prolonged in hemorrhagic disease of the new-born, than is the bleeding time. The coagulation time is only slightly prolonged in thrombopenic purpura in contrast to prolonged bleeding time In hemophilia the coagulation time is over 30 minutes while the bleeding time from a small incision is normal because the tissue juice from the margin of the incision supplies the blood deficiencies enabling a clot to form.

Blood Culture.

Wash thoroughly with hot water and soap the skin at the bend of the arm. Cleanse with alcohol and apply a wet dressing of 1 : 1,000 bichloride of mercury for half an hour Apply the tourniquet, remove gauze and apply tincture of iodine over a prominent vein Ask the patient to keep hand clenched. Avoid touching the skin at the site of the puncture with the hand If necessary to palpate the vein wear sterile rubber gloves or cover finger with sterile gauze Withdraw 10 to 15 c c of blood in a sterile 20 c.c. syringe with a 20 gauge needle.

1. Inoculate a flask of 150 c.c. of glucose (0.2 per cent) hormone broth (pH 7.4 to 7.6) with 5 or preferably 10 c c of blood. The Kracke heart-brain broth is also recommended Other media may be used depending upon the infection suspected.

2. Place 5 c.c of blood in a test tube carrying sterile sodium citrate and rtoate thoroughly to prevent coagulation. (These tubes are prepared by placing 2 c c of a sterile 10 per cent solution of sodium citrate in distilled water

in each. Place in incubator or water bath until evaporated to dryness. Replace cotton with boiled rubber stoppers Each tube will contain 0 3 Gm. sodium citrate sufficient for 5 c c blood.)

3. In the laboratory culture the citrated blood as follows (*a*) Melt 2 tubes of plain or glucose agar in a water bath and cool to 42° C , (*b*) To one add 1 c c of citrated blood and to the second 2 c c with a sterile pipette ; (*c*) Pour into 2 sterile petri dishes and mix thoroughly , label each plate with amount of blood used ; (*d*) Allow to harden and incubate covers down

4 Incubate the flask and plates for 48 hours when a preliminary report should be made. With great care against contamination, prepare a smear of the supernatant broth and stain by the method of Gram At the same time subculture about 0 5 c c of the sedimented blood and broth on a slant of blood agar Repeat every 2 or 3 days for 10 to 21 days if there is no growth before rendering a final report. If growths develop identify the organism If a growth appears in plates, report the number of colonies per c c of blood

Blood Urea (Mercury Combining Method)

1. To 7 c c. of 10 per cent trichloracetic acid in a graduated centrifuge tube add 7 c c. of oxalated blood, a few drops at a time, shaking between each addition.

2 Centrifuge at high speed for 5 minutes Pipette off 5 c c of clear supernatant fluid.

3. To this add 5 per cent bichloride of mercury until saturation occurs Excess bichloride gives a faint brown color when added to saturated solution of sodium carbonate. 1 5 c.c bichloride may be used at once for the normal blood urea If a drop of mixture added to sodium carbonate on a white plate does not show brown in three seconds add 0 25 c c of bichloride Mix and test with sodium carbonate Repeat until color appears

4 Multiply cubic centimeters of 5 per cent bichloride used by 40 and subtract 60 to obtain mg of urea per 100 c c of blood

Normal 20 to 40 mg

Urea nitrogen $=$ ½ urea

Blood urea is raised in chronic renal disease, in prostatic or other urologic obstruction and in intestinal obstruction and dehydration

Blood Sugar (Folin-WU)

1. Add 2 c ... tilled water Add 2 c c. 10 per cent sodium ... sulphuric acid, a few drops a ... ure should be chocolate-brown Filter

2 In a Folin sugar tube marked "unknown" place 2 c c of filtrate In another marked standard place 2 c c. standard containing 0 2 mg dextrose.

To each tube add 2 c.c. alkaline copper tartarate solution. Place tubes in boiling water 6 minutes. Then in cold water 2 to 3 minutes. To each tube add 2 c.c. molybdate phosphate solution. Dilute both tubes to 25 c.c. mark. Compare with colorimeter.

$$\frac{\textit{Reading of Standard}}{\textit{Reading of unknown}} \times 100 \textit{ mg. per } 100 \textit{ c.c. blood}$$

Normal 80 to 120 mg. per 100 c.c. of blood.

Examination of Blood for Microfilaria.

1 *Wet Method*—Puncture finger as usual and place a large drop of blood on a slide. Immediately cover with a cover glass and examine with a low power lens. The larvae can be located by the disturbance they produce among the corpuscles Some species appear periodically in the peripheral circulation and in the case of Wucheria Bantrofti are more numerous at about 2 A.M. Should the above method fail to reveal the larvae, the concentration method is recommended

2. *"Thick Drop" Preparation*—Two big drops of blood obtained after puncturing the finger are placed on a glass slide. The thick film is allowed to dry thoroughly taking care not to allow any dust or fibres to settle down on it. *Do not fix the slide at this stage.*

The slide is placed in a staining dish with the film side down and distilled water is poured by the side of the slide so that the film comes in contact with distilled water. Allow the water to dehemoglobinise the film for 5 minutes. Gently remove the slide and allow it to dry without blotting. When dry fix and stain with Giemsa in the usual way.

Blood parasites such as malaria, microfilaria, trypanosomes, etc, are seen more readily by this method than in the usual blood smear as each field corresponds to several fields by the usual method. For studying the characters of the parasites the usual method is preferable.

3 *Concentration Method*—Collect about 1 c.c. of blood from a finger puncture in 4 c.c of 1 per cent acetic or 2 per cent oxalic acid. Mix well and centrifuge Spread the sediment on a slide, cover with cover glass and examine under microscope ($\times$ 80 magnification).

4 *Staining Method*—Make blood smear in the usual manner or from the sediment obtained by concentration method. Dry, fix and stain by Lieshman or Giemsa.

Examination of Blood for Kala-Azar.

1. Thick film is prepared by placing 4 drops of blood on a clean slide, mixed so as to cover an area of ½ sq. in. The film is covered with a petri dish, and dried at 37° C for two hours It is then flooded with glacial acetic acid (2.5 per cent) 4 parts, crystalline tartaric acid (2 per cent) 1 part. The action should be complete in 5 to 10 minutes After tilting off the fluid, the film

should be fixed with methyl alcohol and stained with dilute Giemsa By this method the parasites may be found, enclosed in leucocytes, in 67 per cent of kala-azar cases.

2 *Sternal Puncture*—Sternal puncture is stated to be simpler, safer and surer as a method of diagnosis than spleen puncture In young children the method of selection is tibial puncture The point selected is the outer face of the tibial epiphysis, 1 cm below the knee-joint A fine trocar and cannula is passed till entry into the spongy tissue is felt by sudden loss of resistance

For sternal puncture a shortened lumbar puncture needle can be employed It is inserted in the mid line at an angle of 30 or 40 degrees at the level of the upper half of the second or third interspace The needle with contained stylet is pushed with a boring action through the bony lamina When the marrow cavity is reached, the stylet is removed and a syringe for aspiration attached to the needle A smear is made on a clean slide, dried and stained by Leishman's or Giemsa's method The parasite is easily recognised by its size, shape and two chromatin masses

Aldehyde Test—About 5 c c of blood is withdrawn from a vein and allowed to stand a sufficient time for the serum to separate, 1 c.c of clear serum is then placed in a test tube (3 by ½ in) and to this 1 drop of 30 per cent formaldehyde is added. The serum is at once well shaken and placed in a test tube rack at room temperature. A control of normal serum should always be made Napier states that "jellification" with opacity (like white of an egg) of the serum may be taken as diagnostic of kala-azar if the disease is of three or four months' standing, but milkiness of the serum without solidification only takes place in early cases of infection. Should the serum be hemoglobin stained, this will change to chocolate brown after 24 hours In certain cases of syphilis, leprosy, phthisis, and malaria the serum will solidify, but remain clear and does not become opalescent as in kala-azar The reaction which occurs in 20 minutes, is given as + + + ; after 2 hours as + + , after 24 hours as +.

Antimony Test—One to two drops of blood from the pricked finger are allowed to flow into a Dryer's tube in which has been placed 0 25 c c of a 2 per cent potassium acetate solution The tube is then inverted to mix the contents; a little of this mixture is transferred to another tube, and a 4 per cent solution of the antimony compound (stiburea) is added by means of a capillary pipette and allowed to percolate along the wall, so that it comes to lie below the blood mixture In a positive case a flocculent precipitate forms at the junction In very early cases it may not appear for 10-15 minutes; in more advanced cases it is immediate The character of the precipitate is important in kala-azar, it is so flocculent that it is not easily broken up by shaking and it does not disappear in 24 hours

It is important that alcohol should not be used for cleansing the finger. Out of 201 cases of kala-azar diagnosed by discovery of the parasite, 156 gave a positive antimony test, and 128 the aldehyde test

Blood Culture—The presence of the parasite in the peripheral blood can best be demonstrated by blood culture. For this purpose 2 c c. of blood should

be drawn off by means of a 2 c.c. Record Syringe and mixed with 1 c c. of 6 per cent citrate solution in a sterile tube, which should be placed in a cool incubator and allowed to sediment for 2 hours The deposit at the bottom of the citrate solution is then drawn up by means of a pipette, inoculated into two or more tubes of N. N. N. medium, and again placed in a cool incubator Examination of the culture should be made about the 10th day, when flagellate forms may be observed, but it is not wise to discard the tube as negative until at least 20 days of incubation have elapsed Spleen pulp or bone marrow may also be cultured in the same manner.

Test for L. D. Bodies in Oriental Sore

The skin at the edge of the ulcer is sterilized and a fine glass pipette run in through a puncture made in the skin, with the object of getting beneath the ulcer, so as to obtain serum and tissue cells, but not blood A smear is made, dried and stained with Lieshman or Giemsa. It is examined under 1/12 oil-immersion lens

II. URINE

1. Record
   (*a*) *Color*—Dark yellow, light yellow, watery, etc.
   (*b*) Clearness or turbidity.
   (*c*) *Reaction*—Use blue litmus. Acid renders it red; alkali, blue.
   (*d*) *Specific Gravity*—See that the urinometer floats freely.

2 Mix well and centrifuge a tube full for at least 4 minutes

3. *Sugar Test*—To 5 c.c. of Benedict's qualitative solution (about 1 inch in a test tube of ⅝ inch diameter) add 0.5 c c. (8 drops, not more) of urine. Heat over a flame for one to two minutes, shaking the tube to prevent solution spurting out, or better, stand the tube in boiling water, two to three minutes, not more.

Negative—Clear blue or bluish green with gray precipitate.

Positive—Opaque with a yellow or red sediment. The amount of sediment depends upon the amount of sugar present. If the result is doubtful, allow to cool spontaneously before reading. If the sugar test is positive, test for ketone bodies by the nitroprusside reaction.

4 *Test for Ketone Bodies*—To 10 c c. of the urine add an excess of solid ammonium sulphate so that the urine is completely saturated. Then add two or three drops of freshly prepared aqueous solution of sodium nitropru and 2 or 3 c c of concentrated ammonia. Allow to stand for at least 30 mi A characteristic permanganate color indicates the presence of ace. aceto-acetic acid.

5. *Albumin Test*—Filter the urine till it is clear. Pour it into until it is about 2/3 full. Boil the top part of the column of

shaking. A turbidity indicates albumin or earthy phosphates. Add a drop or two of glacial acetic acid. If turbidity persists, it is due to the presence of albumin. Earthy phosphate will dissolve after the addition of acid.

6 *Bile Salts*—Sprinkle the surface of urine in a test tube with flowers of sulphur. The particles fall to the bottom of the test tube if bile salts are present.

Bile Pigments—Take a few c.c. of yellow nitric acid in a test tube and by means of a pipette carefully place on the surface an equal quantity of urine. Shake the tube gently from side to side and note the play of colors. Proceeding from acid to urine the colors are yellow, red, violet, blue and green.

7. *Microscopic Examination*—The urine is centrifuged The sediment obtained after centrifugalising is either organised or unorganised. Organised sediment consists of casts, epithelial cells from the different parts of the genito-urinary tract, pus, blood cells, spermatozoa, parasites, etc. Red blood cells appear as pale yellow discs, sometimes crenated and usually bigger than the normal red blood cells in blood Less than 4 R. B. C. per high field are disregarded, 4 to 10 per high field are reported as few red cells; 10 to 25 as frequent red cells, 25 or more as many red cells. Pus cells appear as discs slightly larger in size than red blood cells They are of a pale greenish color and show the presence of nucleus which is frequently obscured by fine refractile granules The addition of a little dilute acetic acid brings the nuclei into view. Less than 10 pus cells per high field are disregarded; 10 to 25 pus cells per high field are reported as few pus cells, 25 to 100 pus cells per field as frequent pus cells; over 100 pus cells are reported as much pus.

Casts should not be confused with cylindroids, mucus threads or fibres of cotton A cast should have two parallel sides, be at least three times as long as it is broad and have two rounded ends Many casts are broken but at least three or four perfect specimens should be seen before reporting casts present Neither end should taper and come to a tail as do cylindroids Use the low power lens Three to 10 casts in the whole sediment are reported as few casts, 10 to 25 frequent casts For identification of variety of casts high power lens may be used When more than one-half the cast is clear it is reported as hyaline, when more than one-half is granular it is reported as granular Pus casts, blood casts or epithelial casts are reported as such

Unorganised sediments vary with the reaction of the urine The more common variations are given below.

Sediment in Acid Urine

Uric Acid—Light yellow to dark reddish-brown crystals, of very varied forms—rhombic [illegible] edges, rosettes, dumbells, whet-stone, etc Soluble in sodium hydr[illegible] reprecipitated by hydrochloric acid.

Ura[illegible] on warming, sometimes amorphous, sometimes crystalline as [illegible] fan shaped clusters of prismatic needles.

bottles (with rubber caps) of cholera serum preserved with 0.5 per cent carbolic acid, in dilutions of 1 : 80, 1 : 160, 1 : 320, 1 · 640, be kept. If an agglutination is obtained with the lower dilutions it may subsequently be titrated with the higher ones.

5 The peptone culture can then be spread with a platinum loop on alkaline agar, and a pure culture obtained by this means The cholera colonies can easily be recognised by their transparent bluish-grey appearance. The hemolytic and sugar tests may then be applied. It has been found that vibrios agglutinating with specific serum in high dilutions invariably give correct sugar, hemolytic, and cholera red reactions.

IV. EXAMINATION OF PUS SMEARS

Make two thin smears in every case. Dry them at once. Fix by moderate heat before staining.

Slide 1—Stain with methylene blue for one minute. Wash, blot and dry. This stain gives the best outline of cells and bacteria.

Examine under the oil-immersion lens for:

1. *Type of Cell*—Polymorphonuclear
   Monocyte
   Lymphocyte
   Epithelial cell
2. *Micro-organisms*—Morphology
   Frequency
   Intracellular or
   Extracellular.

To classify bacteria when present use Gram's stain on slide 2 as follows:

1. Crystal violet, 1 minute and wash.
2. Gram's iodine, one minute and wash.
3. Alcohol or acetone to dicolorize.
4. Safranin, twenty seconds.

Gram positive is purple ...	Gram negative is red.
Gram positive bacilli ...	Gram negative Cocci.
Diphtheria Bacillis Welchii ...	Gonococcus.
Tubercle. Malignant edema ...	Meningococcus.
Boas-oppler. Tetanus ...	M. Catarrhalis
Subtilis Anthrax ...	...

All other bacilli are Gram negative. All other cocci are Gram positive.

V. EXAMINATION OF SPUTUM FOR TUBERCLE BACILLI

1. Prepare a thin smear of the material on a glass slide.
2. Dry in air and fix by gentle heat.

3. Cover smear with undiluted carbbol-fuchsin, gently heating to steaming for 5 minutes Do not boil.

4. Wash in tap water.

5. Decolorize with acid alcohol (2 per cent Hcl. in 95 per cent alcohol), 15 per cent sulphuric acid or 30 per cent nitric acid in water.

6 Wash in water.

7. Counterstain with Loeffler's methylene blue for 2 minutes.

8. Wash in water

9 Dry and examine with oil immersion lens.

The acid fast organisms will appear red, all other organisms and cells will appear blue.

Antiformin Method—Place 24 hours sputum and 50 per cent antiformin solution in equal parts in a small beaker.

2. Warm gently for 10 minutes, stirring occasionally to insure complete liquefaction.

3 Dilute with 3 volumes of water to reduce specific gravity of the solution.

4 Centrifuge for 10 to 30 minutes, pour off supernatant fluid, fill tube up with solution; centrifuge, continue until all of the fluid has been centrifuged

5 To sediment left, after pouring off supernatant fluid, add sterile distilled water, centrifuge and pour off fluid

6 By means of a platinum loop transfer sediment to cover glass

7 Make smears and stain for acid fast bacilli as described

If the sediment does not adhere to the slide apply a thin layer of raw egg albumin to the slide and spread the sediment.

VI BACTERIOLOGICAL DIAGNOSIS OF DIPHTHERIA

1 *Smear*—By means of a cotton swab or platinum loop secure a small bit of exudate or membrane to be examined (usually from nose and throat). Make a thin smear on a slide Stain with Loeffler's methylene blue for one or two minutes Wash with water, dry and examine with oil immersion objective. The diphtheria bacilli will appear as rather short, irregular staining, occasionally club shaped bacilli arranged parallel or around a common centre like the spokes of a wheel They can be divided into three main types—solid, barred and granular.

2 *Culture*—With cotton swab or platinum loop secure specimen as described above. Smear over surface of Loeffler's blood serum medium,

bottles (with rubber caps) of cholera serum preserved with 0 5 per cent carbolic acid, *in dilutions of 1 : 80, 1 : 160, 1 : 320, 1 : 640, be kept. If an agglutination* is obtained with the lower dilutions it may subsequently be titrated with the higher ones.

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1. *Type of Cell*—Polymorphonuclear
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   Lymphocyte
   Epithelial cell
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   Frequency
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To classify bacteria when present use Gram's stain on slide 2 as follows:

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Gram positive is purple	Gram negative is red
Gram positive bacilli	*Gram negative Cocci.*
Diphtheria Bacillis Welchii	Gonococcus
Tubercle. Malignant edema	Meningococcus.
Boas-oppler. Tetanus	M. Catarrhalis.
Subtilis Anthrax	

All other bacilli are Gram negative. All other cocci are Gram positive.

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1. Prepare a thin smear of the material on a glass slide.
2. Dry in air and fix by gentle heat.

3. Cover smear with undiluted carbbol-fuchsin, gently heating to steaming for 5 minutes Do not boil

4. Wash in tap water.

5. Decolorize with acid alcohol (2 per cent Hcl in 95 per cent alcohol), 15 per cent sulphuric acid or 30 per cent nitric acid in water.

6 Wash in water

7. Counterstain with Loeffler's methylene blue for 2 minutes

8. Wash in water.

9. Dry and examine with oil immersion lens

The acid fast organisms will appear red ; all other organisms and cells will appear blue

Antiformin Method—Place 24 hours sputum and 50 per cent antiformin solution in equal parts in a small beaker.

2. Warm gently for 10 minutes, stirring occasionally to insure complete liquefaction.

3 Dilute with 3 volumes of water to reduce specific gravity of the solution.

4 Centrifuge for 10 to 30 minutes, pour off supernatant fluid, fill tube up with solution, centrifuge, continue until all of the fluid has been centrifuged.

5. To sediment left, after pouring off supernatant fluid, add sterile distilled water, centrifuge and pour off fluid.

6 By means of a platinum loop transfer sediment to cover glass

7 Make smears and stain for acid fast bacilli as described

If the sediment does not adhere to the slide apply a thin layer of raw egg albumin to the slide and spread the sediment

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2 *Culture*—With cotton swab or platinum loop secure specimen as described above Smear over surface of Loeffler's blood serum medium.

Incubate at 37° C for 18 to 24 hours. In 18 to 24 hours the diphtheria bacilli produce a luxuriant, yellowish white or creamy growth, usually in the form of isolated colonies

From this make a smear on a glass slide or cover glass and stain as described above

B Hoffmanii and B. Xerosis *differ from true diphtheria bacilli in that* they are shorter, thicker, often not curved, rarely give the blue dot staining at both ends, produce little or no gas in sugar media and are non-virulent.

VII BACTERIOLOGICAL DIAGNOSIS OF GONOCOCCUS INFECTIONS

1 *Smear*—Make two thin smears of exudate. Dry in air and fix with heat Stain one slide with Loeffler's methylene blue and the other with Gram's method Wash, dry and mount. The gonococci will appear as biscuit or coffee bean shaped diplococci. They are Gram-negative and therefore stain red or pink with Gram's stain

2 *Examination of Urine*—Centrifuge urine, remove sediment to slide, dry, fix by heat and stain as described.

VIII BACTERIOLOGICAL DIAGNOSIS OF LEPROSY

1 *Examination of Skin Lesions*—Scrape a nodule or spot deeply with scalpel until epidermis is removed and serum exudes.

Prepare smears of the serum and stain by Ziehl Neelsen's method for acid fast bacilli Twenty per cent sulphuric acid is preferred by some instead of acid alcohol for decolorizing The lepra bacilli are less resistant to acid alcohol than the tubercle bacillus Be careful not to carry the decolorization too far

2. *Smears of Nasal Mucus*—If coryza does not exist give patient 60 grains of potassium iodide Prepare smears of scrapings from ulcerations on nasal septum if present, or from the nasal mucus Stain and examine by method described above

IX BACTERIOLOGICAL DIAGNOSIS OF PLAGUE

1 In the bubonic type prepare smears and cultures of pus aspirated or taken from the glands If these are small, hard and difficult to aspirate, excise a gland *In the pneumonic type prepare* smears and cultures of the sputum A blood culture is advisable in all cases

2. Stain smears by the method of Gram; also with methylene blue or dilute carbol fuchsin

3. Inoculate plates of blood agar by the surface streak method. For blood cultures use nutrient broth.

4. Incubate at 30° to 35° C *for 48 hours and examine*. The bacilli are short and thick with rounded ends and convex sides, occurring singly or in pairs and at times in short chains or small groups. They are gram-negative and bipolar.

X. BACTERIOLOGICAL DIAGNOSIS OF TYPHOID FEVER

1. *Blood Culture*—Blood cultures are of particular value in the early diagnosis of typhoid during the first week or ten days

2 Inoculate nutrient broth or bile broth flasks containing about 200 c.c of the medium, with 5 to 10 c.c of blood from the patient

3 Incubate at 37° C and examine daily.

4 Make smears and subcultures for identifying gram negative bacilli

Routine Slow Macroscopic Agglutination Test (Widal)

1. The serum should be clear, free of erythrocytes and not too heavily colored with hemoglobin. If necessary, centrifuge the specimen

2 Arrange 10 small test tubes in a rack

3 Place 0 9 c.c. of normal saline solution in the first tube and 0 5 c c in each of the remaining tubes.

4 Place 0 1 c.c. of serum in the first tube, mix, transfer 0 5 c c to tube No. 2; mix, transfer 0 5 c.c to tube No. 3 and so on to tube No 9 from which 0.5 c c. is discarded.

5. To each tube add 0 5 c c. of antigen (well shaken) and mix thoroughly The final dilutions of serum in the first nine tubes are now 1 20, 1 40, 1 80, 1:160, 1:320, 1:640, 1:1,280, 1 . 2,560 and 1 5,120 respectively Tube No. 10 is the antigen control.

6. It is advisable to set up tests employing known positive and negative sera at the same time and in the same manner

7. Incubate at 55° C (preferably in a water bath) overnight (15 to 18 hours) followed by 2 hours in a refrigerator before reading and recording the reactions

8 The antigen control should show no agglutination It should be uniformly turbid If there is any settling at all, it should show only as a small deposit in the bottom of the tube which is readily resuspended by gentle mixing Examine the negative serum control to eliminate any possible non-specific or spontaneous agglutination in dilutions other than those considered within the normal limits of agglutination due to natural agglutinin The positive controls should show marked agglutination indicative of a satisfactory sensitivity of the antigen.

9 Positive reactions may be read and recorded for each tube as follows:

Complete agglutination with perfectly clear supernatant fluid = 4+

Marked agglutination with slightly turbid supernatant fluid = 3 +

Moderate agglutination with turbid supernatant fluid = 2 +

Slight agglutination with turbid supernatant fluid = 1 +

With phenolized, heat killed and formalized antigens (H) the agglutinated micro-organisms occur as flocculent sediments, are granular and less voluminous

To examine sediment, hold the tube rigid at the top and gently tap the bottom just sufficient to stir up the sediment which appears as masses or clumps in positive reactions Too much agitation may suspend the antigen.

10 The highest final dilution of serum showing a +2 reaction may be regarded as the titer.

Microscopic Agglutination Test employing Living Culture

This test may be employed in conducting the Widal or agglutination test for typhoid and paratyphoid fevers, but has been largely replaced by the macroscopic slow agglutination test employing formalized (flagellar or H) and alcoholic (somatic or O) antigens Since living cultures are employed, due care must be exercised and slides, cover glasses, etc., placed in a disinfectant solution or boiled for 5 minutes before handling and cleaning The table should be wiped clean with a disinfectant solution.

1 Take 2 small watch crystals, hollow slides or small test tubes and place 0 05 c c of serum in each

2 Add to one 1 0 c c of normal salt solution and to the other 2 0 c c., making dilutions approximately 1 : 20 and 1 : 40 respectively

3 Place 1 loopful of culture of typhoid bacillus antigen in the middle of each of 3 cover glasses

4 To the first mix 1 loopful of serum diluted 1 . 20 ; to the second 1 loopful of serum diluted 1 · 40 ; to the third 1 loopful of normal salt solution which is the antigen control

5 Mount each in vaseline on hanging drop slide The final dilutions obtained are 1 40 and 1 . 80 Therefore mark the slides as follows No 1, 1 · 40 , No 2, 1 80 ; No 3 control

6 Make similar preparations with the paratyphoid cultures

7 Allow to stand at room temperature or preferably in an incubator at 37° C for an hour

8 Examine with 1/6 objective using very subdued light. Controls should be inspected first and should not show any clumping or loss of motility

9 Examine the 1 . 40 and 1 : 80 dilutions for loss of motility and agglutination

10 Higher dilutions may be employed, but the above are ordinarily sufficient.

Interpretation of Widal Test

Slow Macroscopic Method—Normal sera may agglutinate H. antigen at about 1 : 20 and O antigen in final dilutions upto 1 : 80. Agglutination of H. antigen at 1 : 40 is suspicious and at 1 . 80 or higher definitely indicative of typhoid fever in individuals who have not been previously immunized with

T A B vaccine. Agglutination of O antigen at 1 · 160 or higher is also indicative of typhoid fever in individuals not immunized with T A B vaccine

Active immunization with typhoid paratyphoid vaccine produces both H and O agglutinins The presence of O agglutinin in higher titer, with H agglutinin in low titer, is indicative of typhoid fever in a previously vaccinated individual However a very high titer of H agglutinin, as for example, 1 1,280 or 1 . 2,560 may be indicative of typhoid fever in a previously vaccinated individual since it is rather unusual for H agglutinin to persist in titers of more than 1:640 for longer than 6 months after immunization Consequently, when the disease is suspected in a previously vaccinated individual the tests should be repeated every 3 to 5 days with the same antigens If the titers progressively increase and especially for O antigen, typhoid fever is most likely present

XI. CEREBROSPINAL FLUID

Macroscopic Examination

Color—Normally like distilled water, may be clear but yellowish (Xantho-chromia)

2 *For Appearance*—Normally clear, may be apalescent turbid or purulent.

3 *Color of Sediment*—Whether white, yellowish, grayish or greenish

4 *For Coagula*—Normally none, may show flakes, cobweb coagula May solidify (called massive coagulation and usually associated with Xanthochromia, syndrome of Froin)

5 *For Blood*—By naked eye appearance

Total Cell Count

1 Count should be made immediately or within a few hours after withdrawal of fluid by spinal puncture Worthless if the fluid contains enough blood for naked eye detection Counts are too low if made after coagula have formed.

2 Use white corpuscle pipette drawing fluid to 1 and shaken spinal fluid to mark 11

3. Shake well, discard first drop or two and place drop in Fuch's Rosenthal counting chamber. Allow cells to settle for 10 minutes

4 Count all of the cells (erythrocytes are hemolyzed) in the entire ruled off area and multiply by 0 35 to give the number of cells for each cu mm of spinal fluid The error incident to this calculation is practically balanced by the opposite error due to dilution.

5 If the Fuchs-Rosenthal chamber is not available, the ordinary leucocyte counting chamber may be used In this count the cells in the entire

ruled off area (9 large squares, 0 9 c mm.); divide by 9 and multiply by 11. This calculation compensates and gives the total cells per c mm.

Differential Cell Count and Cytodiagnosis.

1 Centrifuge fresh specimen of fluid.

2 Pour off supernatant fluid and make thin smear of sediment as described for blood.

3 Dry in air.

4 Stain with Wright's stain, or with methylene blue.

5 Count and tabulate cells (lymphocytes, polymorphonuclear and endothelial cells) as described under method for differential count of leukocytes, and determine the number of each variety per hundred cells.

6 Normally, only lymphocytes and occasionally endothelial cells are found Acute suppurative meningitis due to pneumococcus, meningococcus, streptococcus, etc —polymorphonuclear cells predominate in acute stage

Tuberculous Meningitis—Small lymphocytes predominate

Acute Anterior Poliomyelitis—Polymorphonuclears early, later small lymphocytes

Syphilis (Paresis, Tabes, etc)—Small lymphocytes predominate.

Serous Meningitis—Endothelial cells predominate.

Make direct smears if cloudy, otherwise centrifuge and make smears from the deposit Stain by methylene blue, Gram's and if necessary by Ziehl Neelson's method Culture on blood agar

Pandy Test.

1 Place about 1 c c of a saturated solution of phenol in a test tube.

2 Add 1 drop of fluid to be tested

3 If there is an increased amount of globulin present a bluish white ring or cloud is formed immediately.

Colloidal Gold Test.

1 Place 11 chemically clean test tubes in a rack.

2 Into the first tube place 1 8 c c. of 0 4 per cent Nacl solution and 1 c c. in each of the remaining ten tubes

3. Add 0 2 c c of spinal fluid to the first tube and thoroughly mix.

4 Remove 1.0 c c. from the first tube and place in the second tube; mix thoroughly and remove 1.0 c c. and place in the third tube, continue until the 10th tube is reached and then discard 1 0 c.c. from this tube. The eleventh tube is used as a control.

5 Add to each tube 5 c c of colloidal gold reagent

6. Mix thoroughly and set aside for 24 hours, at the end of which time the readings are made

7 *Readings*—Each tube is examined and the reaction recorded using the numbers 0 to 5.

0 = Unchanged as compared with control

1 = Reddish blue.

2 = Lilac or purple

3 = Blue.

4 = Almost colorless (trace of blue)

5 = Colorless

8 The readings are recorded in the order the tubes stand, *e g*,

5, 5, 5, 5, 4, 3, 1, 0, 0, 0, 0	paretic curve
1, 1, 1, 2, 3, 2, 1, 0, 0, 0, 0	luetic curve
0, 0, 1, 1, 1, 2, 2, 3, 2, 1	meningitic curve

XII. REAGENTS STAINS AND CULTURE MEDIA

1 Diluting fluid for leukocytes

Acid oxalic	2 Gm
Distilled water	100 c c

Dissolve the acid and filter

2 Diluting fluid for R B C

Mercury bichloride	0 5 Gm
Sodium chloride	1 0 Gm
Sodium sulphate	5 0 Gm
Distilled water	200 0 c c. Filter.

3 Benedict's reagent (qualitative)

Copper sulphate	17 3 Gm
Sodium citrate	173 Gm.
Sodium carbonate (anhydrous)	100 Gm.
Distilled water to make	1,000 c c

Dissolve the citrate and carbonate in about 500 c c of distilled water by boiling Filter

Dissolve the copper sulphate in about 100 c c. of water

Add the copper solution slowly to the citrate and carbonate solution and stir continuously while adding.

Measure and add sufficient water to make the total volume 1,000 c c.

4 Benedict's reagent (quantitative):

Copper sulphate	18 Gm.
Potassium Sulphocyanate	125 Gm
Sodium Carbonate (anhydrous)	100 Gm.
Sodium citrate	200 Gm
Potassium ferrocyanide 5 per cent solution	5 c c.
Distilled water to make	1,000 c.c.

Dissolve the sulphocyanate, carbonate and citrate in about 800 c c. of distilled water by heat

Dissolve copper sulphate in about 100 c c. of water and add slowly to above solution and stir well while adding. Add 5 c.c. of the 5 per cent potassium ferrocyanide solution

Cool and add sufficient water to make 1,000 c.c.

5 Loeffler's Methylene Blue

Saturated alcoholic solution of Methylene blue	30 c.c.
Potassium hydroxide (0.01 per cent)	100 c c

6. Ziehl Neelson's solution.

Distilled water	10 c.c.
Carbolic acid (crystals)	5 Gm.
Alcohol	10 c c.
Fuchsin	1 Gm.

7 Gram's Stain

Solution No 1 (Weigert's Gentian-violet)—

Gentian violet	2 Gm
Anilin oil	9 c.c.
Alcohol (95 per cent)	33 c c.

Solution No 2 (Gram's Iodine)—

Iodine	1 Gm.
Potassium iodide	2 Gm.
Distilled water	300 c.c.

Dissolve potassium iodide in a small quantity of water, add iodine, shake it till it dissolves Make up the volume to 300 c.c.

Dilute Saffranin O solution

Saffranin O	0 5 Gm
Distilled water	1,000 c c.
Filter	

8 Wright's Stain

Dissolve 0 1 gm of powdered stain in 60 c c. of special absolute methyl alcohol

9. Leishman's Stain

Dissolve 0 15 gm of the powdered stain in 100 c c. of special absolute methyl alcohol.

10 *Giemsa Stain*.

This is believed to be the best modification of the Romanowsky stain for malarial and other blood parasites and is also very satisfactory as a routine blood stain.

1. Place 75 c c. of C. P. acetone-free methyl alcohol and 25 c.c of acid-free glycerin in a beaker. Put in a warm bath and add 0 75 gm of imported dry powder Giemsa stain and warm to 60° C
2. Stir with a glass rod. Filter through No. 4 dry filter paper into a dry clean bottle and keep well stoppered
3. For use, dilute 1 part of stock stain with 4 parts C P acetone-free methyl alcohol every 2 weeks

The method of staining with Giemsa stain has been described earlier. A quick method is as follows.

1. Cover film with 15 drops and stain for 1 minute
2. Add 30 drops of distilled water, mix well and stain for 5 minutes.
3. Wash by flooding with distilled water.
4. Blot dry or stand on end and dry in air

11. Acid Hematoxylin and Eosin ·

Solution A

Glycerin	240 c c.
Sat solution of Pot Alum in distilled water	240 c c.

Keep in a well stoppered bottle, shake frequently for 2 or 3 days, filter through wet filter paper.

Solution B.

Dissolve 16 gms of hematoxylin (light) in 480 c.c. of 96 per cent alcohol.

Mix solutions A and B Expose to light in a bottle plugged with cotton wool for about a fortnight. Add 24 c c of glacial acetic acid. Mix well and filter the next day. Keep in a well stoppered bottle in the dark Use after 6 months The staining solution should always be filtered before use

Eosin W. Gelb (Grubler) 1 per cent solution in distilled water.

12. Rosenow Glucose Brain Broth for isolation of fastidious bacteria, especially streptococci

Meat infusion broth	1,000 0 c.c.
Bactopeptone	5 0 Gm.
Sodium chloride (C. P.)	8 0 Gm.
Glucose	2 0 Gm.
Andrade's indicator	10 0 c c.

Preparation—Dissolve peptone and salt in the meat infusion broth by careful heating. Add indicator and glucose. Adjust to pH 7.0 to 7.5 tube in fairly large tubes (20 by 1 5) cm. the column of broth to be about 12 cm. deep. Add 3 pieces of calf brain about 1 cm. square and 2 or 3 pieces of crushed marble to each tube (dip the pieces of brain in water before tubing to prevent sticking to the tubes) Autoclave at 121° C for 20 minutes.

If the broth is to be used for blood cultures add 5 gm. of sodium citrate to 1,000 c c to prevent coagulation of the blood

13. Blood Agar for isolation of fastidious bacteria:

Melt beef or heart infusion agar which has a reaction of pH 7.4 to 7.6 and cool to 45° C To each 450 c c add 50 c c. of sterile difibrinated, human, horse, or rabbit blood Mix and transfer aseptically to sterile Petri dishes or tubes (all to harden as slants) Incubate at 37° C for 24 to 36 hours as a test for sterility

14 Loffler's blood serum medium is used for isolation and cultivation of diphtheria bacilli

15 Testicular Hydrocele is used for isolation and cultivation of gonococci and meningococci.

16 Dorset Egg Medium and Petroff Medium are used for cultivation of tubercle bacilli

17. Triple NNN Medium is used for cultivation of the Leishmania

18. Cleveland and Collier's Medium is used for cultivation of Entameba Histolytica.

APPENDIX III

NORMAL CLINICAL DATA

BLOOD

Albumin (plasma)	3 6 to 5 gm. per 100 c.c.
Albumin-globulin ratio	1 2 · 1 to 2 · 1
Ammonia	0 35 mg per 100 c c
Amylase (serum)	80 to 190 (mg of sugar produced by 100 c c serum).
Ascorbic acid (plasma)	0 5 to 1 5 mg. per 100 c c
Bilirubin	0 05 to 0 1 mg per 100 c.c.
Bleeding time (blot)	8 min
Calcium (serum)	9 to 11 mg per 100 c c.
Calcium (diffusible)	408 mg per 100 c c
Chloride (as Nacl)	450 to 500 mg per 100 c.c.
Chloride (plasma)	570 to 620 mg per 100 c c.
Cholestrol (plasma)	190 to 310 mg per 100 c.c.
Circulation time (Decholin)	15 Sec
Clot retraction time	24 hours
Clotting time	4 to 8 minutes
Co_2 combining power	55 to 75 vol per cent
Color Index	1
Creatine	3 to 7 mg per 100 c c
Creatinine	1 to 2 mg per 100 c.c
Fibrinogen (as fibrin)	0 3 to 0 6 mg per 100 c c.
Fragility	0 44 to 0 35 per cent salt solution.
Globulin (plasma)	2 0 to 3 5 gm per 100 c.c.
Hemoglobin, female	12 to 16 gm per 100 c c
Hemoglobin, male	14 to 18 gm per c c.
Hydrogen ion concentration	7 4
Icterus index	4 8
Blood nitrogen (total)	0 96 to 1 26 gm. per 100 c c.
Non-protein nitrogen	25 to 38 mg per 100 c c.
Oxygen combining power	18 vols per cent
Phosphate	3 to 4 mg per 100 c c.
Plasma volume	1,600 to 2,250 c c.
Platelets	2,00,000 to 3,00,000 per cmm.
Pressure (systolic)	100 to 130 mm Hg
Pressure (diastolic)	70 to 90 mm Hg.
Protein (plasma)	6 7 gm per 100 c c.
Prothrombin time (quick)	10 to 20 sec
Red cell count (female)	4 2 to 5 4 m. per cmm.

Red cell count, male ...	... 4.6 to 6.2 m. per cmm.
Mean corpuscular volume ...	... 82.0 to 92.0 cu. micra.
Mean corpuscular Hgb. ...	... 28 0 to 32 0 micro-microgm.
Vol packed cells (female) ...	... 37.0 to 47.0 per cent.
Vol. packed cells (male) ...	... 40.0 to 54 0 per cent.
Reticulocytes ...	... 40,000 to 50,000 per cu. mm.
Sedimentation rate (male)	... 9 mm. per hour.
Sedimentation rate (female)	... 20 mm. per hour.
Specific gravity ...	... 1.050.
Sugar (dextrose) ...	... 80 to 120 mg. per 100 c.c.
Urea ...	... 15 to 30 mg. per 100 c.c.
Urea Nitrogen ...	... 10 to 15 mg. per 100 c.c.
Uric acid ...	... 2 to 4 mg. per 100 c c.
Velocity (aorta) ...	... 50 cm. per sec.
Venous pressure ...	... 8 cm. water.
Viscosity (relative to water)	... 3.4 to 4 5 c.c.
Volume ...	... 3,000 to 5,000 c.c. (8 to 9 per cent of bodyweight).
White cell count ..	... 6,000 to 10,000 per cu. mm.
White cell differential.	
Basophils ...	... 0 to 1 per cent.
Eosinophils ...	... 1 to 3 per cent.
Lymphocytes ...	... 20 to 30 per cent.
Monocytes ...	... *4 to 8 per cent.*
Myelocytes ...	... 0 per cent.
Neutrophils ...	... 60 to 70 per cent.
Neutrophils (juvenile) ...	... 4 to 8 per cent.
Neutrophils (segmented) ...	... 58 to 62 per cent.
White cell volume, packed cells	... 0.1 c.c. per 100 c.c.

BLOOD THERAPEUTIC LEVELS

Bromide	... Less than 50 mg. per 100 c.c.
Sulfanilamide	... 5 to 15 mg. per 100 c.c.
Sulfapyridine	... 2.5 to 7.5 mg. per 100 c.c.
Sulfadiazine	... 5 0 to 15 mg. per 100 c.c.
Sulfathiazole	... 5 0 to 10 mg. per 100 c.c.
Sulfaguanidine ...	... 0.5 to 5 mg. per 100 c.c.
Thiocyanate	... 9 to 12 mg. per 100 c.c.

CEREBROSPINAL FLUID

Albumin	... 20 mg. per 100 c c.
Cells	... 0 to 5 per cu. mm.
Chloride	... 720 to 750 mg. per 100 c.c.
Colloidal gold, normal ...	... 0000000000.
Colloidal gold, paretic curve	... 5554432100.
Colloidal gold, luetic curve	... 2344321000.

Colloidal gold, meningitic curve ...	1111234555.
Colloidal gold tuberculous curve ...	111242110.
Globulin	6 mg. per 100 c c
Pandy	+=protein over 40 mg per 100 c c
pH	7.4
Protein	16 to 38 mg per 100 c c.
Sugar (dextrose) .. .	45 to 75 per cent of blood level

ELECTROCARDIOGRAM

P wave	0 06 sec
PR interval	0 16 sec (Max 0 2)
QRS waves	0 05 sec.
T	0 06 sec
Time small division . .	0 04 sec
Time large division . ..	0 2 sec

GASTRIC CONTENTS

Acid, free (bread test) .. .	25° to 50°
Acid, total (bread test)	40° to 75°
Acid, free (Histamine test) .	70° to 100°
Acid, total (Histamine test) ..	100° to 130°
Nitrogen	40 to 60 mg per cent
Pepsin	15,000 to 50,000 E units
Volume	15 to 40 c c in 10 min.

LIVER FUNCTION

Bromsulphalein	Less than 10 per cent dye in serum after 30 min
Congo red (amyloidosis) . .	No dye in serum after 60 min
Galactose	Less than 3 gm excretion in 5 hours.
Icterus index	4-8
Leavulose	Less than 30 to 40 mg per cent increase in blood sugar
Takata-ara	Negative
Vanden Bergh (direct)	Negative
Vanden Bergh (indirect)	0 05 to 0 1 mg bilirubin

METABOLISM

The normal B M. R. varies from +10 to —15 per cent. It may be roughly calculated according to the following formula

Pulse pressure + pulse rate —111= B M. R

URINE

Volume	1,000 to 1,500 c.c. in 24 hours.
Specific gravity	1 015 to 1 025
Protein	60 mg. in 24 hours.

Glucose	0.5 gm. in 24 hours.
Phenolsulphonephthalein test ...	55 to 70 per cent in 2 hours.
Urea	50 gm. in 24 hours.
Urea clearance	75 per cent.
Urobilin	Irregular traces.
Pus cells	Less than 1.0 per cent high field.

SEMEN

Normal count	100-150 million spermatozoa per cu c.c.
Motility	10 to 15 per cent immobile forms normal
Abnormal forms	Upto 20 per cent abnormal forms occur in fertile semen.

The lower the count below 60 millions the less the likelihood of fertility.

APPENDIX IV

PREPARATION OF PATIENTS FOR RADIOGRAPHY

BARIUM MEAL—The technic used at present is the double meal method. For the double meal method instructions to patients should include 4 points

1 Take no cathartics or laxatives for 24 hours preceding the date of the examination

2 On the morning of the day of the examination, breakfast about 7-30 a m should be light consisting of bread and butter and, a cup of milk or tea

3 After breakfast, about 8-00 a m. (or 6 hours before the examination), stir up 4 ounces of barium sulphate in a glass of water, milk or butter milk and drink it all

4 Take no more food or drink, except a little water if desired, until after the examination in the afternoon

When the patient appears in the X-ray room, the presence or absence of a six-hour gastric residue is determined and a second barium meal is given to outline the stomach and duodenum In 6 hours the barium has usually progressed to a point somewhere between the cecum and the middle of the transverse colon. The patient is examined flouroscopically from time to time and photographs taken at 6 hours, 9 hours, 24 hours and 48 hours after the first meal

Following the examination of the stomach and duodenum (6 hours after the breakfast) the patient is told to eat his meals as usual and to abstain from cathartics and enemas until after the examination is over

CHOLECYSTOGRAPHY

The patient should receive the following instructions:

1. The day before the examination is to take place take 6 c c. (about 1¼ teaspoonfuls) of paregoric about half an hour before lunch time that noon. Eat the usual lunch and then stir the contents of one bottle of tetraiodophenolphthalein preparation in half a glass of water and drink it all

... no other food or liquid except water until 6 to 7 p m. Then ...ose of 6 c.c. of paregoric about half an hour before the evening ... should contain practically no fat and very little protein ...le and fruit).

... dinner stir the contents of one bottle of a tetraiodophe- ... (Shadocol) in a half glass of water and drink it all.

4. After taking the second dose of dye preparation take no more nourishment until the following morning. Take nothing for breakfast except *fruit juice and tea with sugar but no cream. As much water as desired* may be drunk at any time.

5 Report to the X-ray department, at 9 a.m.

INJECTION OF RADIOPAQUE MATERIAL IN CHEST EXAMINATION

Lipiodol is the substance most commonly employed for injection into the cavities in the lungs or pleura and for observation of the bronchial tree It is best done under flouroscopic control before films are made

Many methods for the injection of iodized oil have been described. In adults the most satisfactory one is the transglottic method with the use of a curved metal cannula The throat is cocainized by spraying with 5 per cent cocaine and adrenaline, and the larynx and upper part of the trachea are sprayed with a less concentrated solution. The curved cannula is then passed through the glottis, usually under indirect vision through a laryngeal mirror but it may be passed blindly as well.

If only the lower lobes are to be examined, the injection may be made in the upright position. Ten c.c. of the oil either full or half strength are instilled For the visualization of the right lower lobe, the patient's trunk is tilted to the right. Similarly, for the visualization of the left lower lobe, it is tilted to the left. The lower parts of the upper lobes are easily filled by tilting the patient further to either side. They are best visualized, however, with the patient in the recumbent position. Either side may be filled by turning the patient so that he lies either on his left or on his right side

INTRATHECAL LIPIODOL INJECTION

The patient is placed in a sitting position and the lumbar puncture needle *is inserted into the subarachnoid space, either into the cisterna magna* or the lumbar canal Two or 3 c.c. of cerebrospinal fluid are sucked into a syringe and an emulsion is formed by thoroughly mixing 1 c.c. of the cerebrospinal fluid with 1 c c. of lipiodol. Then, 1 or 2 c c. of the emulsion is injected into the cisterna magna or into the lumbar subarachnoid space.

PREPARATION FOR RADIOGRAPHY OF URINARY TRACT

1. It is necessary that the patient be adequately prepared in order that as much gas as possible be removed from the intestinal tract before the examination

To this end, patients ordinarily receive on the preceding night an adequate dose of compound liqorice powder. On the morning of the examination a thorough cleansing enema may be given Other measures that may be used for dispelling gas are pituitrin ½ c c. subcutaneously or intravenously and oral use of enzymes or charcoal.

2 *Retrograde Pyelography*—The solution (Neoiopax) is injected through the ureteral catheter under direct cystoscopic vision until the patient complains

of pain in the flank or until the solution is seen to flow back into the bladder The renal pelvis is usually then well filled. Further injection will result in undue distension.

Exposures are made while the solution is being injected or immediately upon its completion

3. The urinary bladder is investigated by injections of 3 per cent solution of sodium iodide through a urethral catheter, the urine having been drained off previously.

4 *Intravenous Urography*—The following substances have been used:

(a) Uroselectan (Iopax).
Adult dose 40 gm in 50 c c. water.

(b) Uroselection B (Neo-iopax)
Adult dose 15 gm. in 20 c c of 10 per cent solution of invert sugar.

(c) Skiodan (Abrodil).
Adult dose 20 gm. in 50 c c
Diluted to 15 per cent or 20 per cent for retrograde urography.

(d) Neo-skiodan (Diodrast)
Adult dose 7 gm in 20 c c water

(e) Hippuran.
Adult dose 12 gm in 20 c c of water

Doses for children are calculated proportionate to weight The injection is made slowly. The best visualization is obtained 5 to 10 minutes after injection, so that first exposure is usually made after this interval Subsequent routine exposures are made 25 and 45 minutes after the injection This procedure is, however, subject to modification as in large hydronephrotic sacs in which excretion is very slow and exposures may be necessary at 2 and 4 hours after the injection. Intravenous urography is contraindicated where the blood urea is very high or renal function very poor

5 Oral and subcutaneous urography were tried very soon after the introduction of intravenous urography. For oral use 15 gm. Hippuran dissolved in simple syrup is administered and exposures made after 90 and 135 minutes In about 50 per cent of the cases satisfactory urograms are obtained Hippuran in watery solution has been used subcutaneously without any necrosis or similar accident Subcutaneous and oral routes are used in infants and small children among whom intravenous urography is not possible

UTERO-TUBOGRAPHY

Utero-tubography is performed both as a diagnostic measure to determine the patency of the tubes and as a therapeutic measure in cases of sterility. The substances injected are either air or lipiodol The patient presents herself for examination about 10 to 12 days, before or after a menstrual period and is instructed to take a mild aperient the night before A preliminary examination

on a 14"×17" film of the entire abdomen is made. The patient is then placed in the lithotomy position on a table equipped with a Bucky diaphragm.

The vulva is scrubbed, the aluminum bivalve speculum passed and the cervix exposed The anterior lip is grasped with a tenaculum about ¼" above the external os, so as not to interfere with proper obturation.

With the special cannula and pressure apparatus attached to the syringe, the oil is injected slowly, with due regard to any reaction on the part of the patient and to the amount of pressure being used. The cervix must be obturated to prevent leakage of oil into the vagina.

Stereoscopic films are taken immediately after the injection is completed and before the removal of the cannula.

All instruments are removed, the vagina is wiped clean and a sterile sponge is placed in the vagina to absorb the lipiodol which is expelled from the uterine cavity.

The patient is then allowed to rise. Another film is made 45 minutes later to determine the condition of the tubes. A final Roentgenographic examination is made within 48 hours of the injection.

In the normal uterus with patent tubes, an average pressure of 150 mm of mercury is required to overcome the resistance of the internal os. When the oil passes into the uterus the pressure drops *16/20 mm. and then gradually* rises in some cases to about 200 mm or higher. The second maximum rise is at the point where the iodized oil is forcing its way through the cornual sphinctres A slight manometric fluctuation caused by uterine contractions and relaxations is observed during the filling of the uterus, and there is a definite drop in the pressure when the lipiodol passes through the permeable tubes. When the tubes are occluded, the pressure may rise to 290 mm This is the highest pressure that can be used with safety. In Senile Uteri, a pressure of more than 120 mm Hg is never used

Suitable apparatus both for air and iodized oil insufflation are Jarcho's pressometer and Robin's pressure apparatus.

APPENDIX V

INFECTIOUS DISEASES

Names.	Period of Incubation	Time of Eruption	Duration of Eruption	Infectious Period	Period of Quarantine
1. Chicken-pox	4 days	2nd day of fever	7 days	Three weeks	21 days from commencement of disease if every scab has fallen off
2. Cholera	A few hours to 10 days, usually 3 to 6 days			7 days from complete cessation of diarrhea	12 days Carriers occur
3. Dengue	3 to 6 days.	5th day of illness	2 to 8 days		7 days
4. Diphtheria	5 days			6 weeks	6 weeks from the commencement if there is no sore throat, and all other signs have disappeared
5. Enteric	14 days.	4th day of fever	20 days	6 weeks	Carriers are frequent
6. Erysipelas	7 days.	2nd day of fever	Indefinite	To end of exanthem	12 days if desquamation has stopped
7. Influenza	1 to 4 days usually 3 to 4			3 days after temperature is normal, and catarrhal discharges cease	5 days
8. Malta Fever	14 days				...
9. Measles	10 days.	4th day of fever.	5 to 10 days	20 days	18 days from commencement, if rash has disappeared and cough ceased
10. Mumps	14 to 25 days.			8 weeks	25 days, if all swelling has subsided.
11. Plague	2 to 8 days	...	...	1 month	21 days.
12. Puerperal Fever	3 to 5 days	...	...	When discharge stops	....
13. Relapsing Fever	2 to 12 days accidental inoculation about 7 days.	...	...	During the first attack and when temperature is rising in each relapse; the spirilla are found in the blood	Until 15 days after last relapse.

Names.	Period of Incubation.	Time of Eruption.	Duration of Eruption.	Infectious Period	Period of Quarantine
14. Ringworm	. .	.. ..	... .	Until there are no broken off diseased hairs.	. ..
15. Roethln	10 days.	2nd day of fever.	3 to 5 days	10 days	15 days
16. Scarlet Fever	6 days.	2nd day of fever	5 to 10 days.	6 weeks.	6 weeks from commencement, if desquamation has ceased, and there is no soreness of the nose.
17. Small-pox	10 to 14 days.	3rd day of fever.	14 to 21 days.	6 weeks	45 days if every scab has fallen off
18. Whooping cough	10 days.	. ...	... ..	6 weeks	42 days, if cough has ceased

APPENDIX VI

DOSAGE FOR CHILDREN

A simple scheme indicating approximate doses on age basis is as follows:

Age.	*Dose*
20 years	adult dose.
10 years	½ adult dose.
5 years	¼ adult dose.
2½ years	⅛ adult dose
1 year	1/12 adult dose.

A method which depends upon the body weight is, however, more satisfactory.

$$\text{Child's dose} = \frac{\text{adult dose} \times \text{weight in lbs}}{150}$$

Children tolerate opiates poorly. On the other hand certain drugs such as arsphenamine, digitalis, atropine, bismuth and sulfonamides are given to children in relatively larger doses than to adults.

APPENDIX VII

LIST OF SANATORIA FOR TUBERCULOSIS

Bihar and Orissa.

Government Sanatorium, Itki, near Ranchi.

Bombay Presidency

1 Turner Sanatorium, Bhoiwada, Parel, Bombay.
2 Dr. Bahadurjee Memorial Sanatorium, Deolali Camp, Bombay.
3. Hindu Sanatorium, Karla, near Poona.
4 Bel-Air Sanatorium, Panchgani, Bombay.
5 Dr Wanless Sanatorium, Miraj, Bombay.
6 Mission Sanatorium, Venguria.

Central India

State Sanatorium, Rao, Indore State.

Central Provinces.

Mission Sanatorium, Pendra Road, Distt Bilaspur, C.P.

Madras Presidency.

1 Union Mission Sanatorium, Arogyavaram, near Madanapalle.
2 Visrauthhipuram Tuberculosis Sanatorium, Rajahmundry, E Godavari Distt (South India)
3 Thambaram Sanatorium, Cheromepet P.O (South India).

Mysore

State Sanatorium, Mysore.

N.-W. F. P.

Government Sanatorium, Dadar. This is now in Pakistan

Punjab:

1 King Edward Sanatorium, Dharampore, Simla Hills.
2. Dr Nanavati's Private Sanatorium, Dharampore.
3. Patiala State Sanatorium, Dharampore.
4. Lady Irwain Sanatorium, near Kasauli.

Rajputana:

Mary Wilson Sanatorium, Tilaunia (*via* Kishengar).

United Provinces:

1 King Edward VII Sanatorium, Bhowali, U.P.
2 Mission Sanatorium for Women, near Almora, U.P.
3 Hillcrest Sanatorium, Gethia, Near Naini Tal.

APPENDIX VIII

HIIL STATIONS AND HEALTH RESORTS

Almora (Alt. 5,494; rainfall 42 40). It has an excellent climate and a great reputation for cases of tuberculosis It is situated at a distance of about 80 miles from Kathgodam

Bangalore (Alt. 3,021, rainfall 35 10; mean temperature 74 3) A very healthy station with a cool, pleasant climate

Cox's Bazar: A well known health resort in Chittagong The surrounding country is hilly and very picturesque. Excellent sea-bathing and good shooting

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APPENDIX VII

LIST OF SANATORIA FOR TUBERCULOSIS

Bihar and Orissa :

Government Sanatorium, Itki, near Ranchi.

Bombay Presidency :

1. Turner Sanatorium, Bhoiwada, Parel, Bombay.
2. Dr Bahadurjee Memorial Sanatorium, Deolali Camp, Bombay.
3. Hindu Sanatorium, Karla, near Poona.
4. Bel-Air Sanatorium, Panchgani, Bombay.
5. Dr Wanless Sanatorium, Miraj, Bombay.
6. Mission Sanatorium, Vengurla.

Central India

State Sanatorium, Rao, Indore State.

Central Provinces :

Mission Sanatorium Pendra Road, Distt. Bilaspur, C.P.

Madras Presidency :

1. Union Mission Sanatorium, Arogyavaram, near Madanapalle.
2. Visranthhipuram Tuberculosis Sanatorium, Rajahmundry, E. Godavari Distt (South India).
3. Thambaram Sanatorium, Cheromepet P.O. (South India).

Mysore

State Sanatorium Mysore.

N.-W. F. P. :

Government Sanatorium, Dadar. This is now in Pakistan.

Punjab

1. King Edward Sanatorium, Dharampore, Simla Hills.
2. Dr. Nanavati's Private Sanatorium, Dharampore.
3. Patiala State Sanatorium, Dharampore.
4. Lady Irwin Sanatorium, near Kasauli.

Rajputana :

Mary Wilson Sanatorium, Tilaunia (via Kishengar).

United Provinces

1. King Edward VII Sanatorium, Bhowali, U.P.
2. Mission Sanatorium for Women, near Almora, U.P.
3. Hillcrest Sanatorium, Gethia, Near Naini Tal.

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HILL STATIONS AND HEALTH RESORTS

Almora (Alt. 5,494; rainfall 42 40). It has an excellent climate and a great reputation for cases of tuberculosis. It is situated at a distance of about 80 miles from Kathgodam

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Puri: It is a popular health resort with good sea bathing. There is a good sea breeze all the year round but the humidity is high.

Pachmarhi (Alt. 3,528; rainfall 76) It is situated on a table land in the Hoshangabad district of C. P. The climate is good.

Panchgani: It is situated at a distance of 29 miles from Wathar in Bombay Presidency Owing to purity of air and exhilarating climate, it is a favourite resort in summer, for people from Bombay.

Quetta (Alt. 5,502; rainfall 10). It has a severe winter and suffers from blizzards

Ranikhet (Alt. 6,069; rainfall 52). Like Almora from which it is only 30 miles, it has an excellent climate

Shillong (Alt 4,920, rainfall 86). It is situated on a plateau in the Khasi Hills and is 67 miles by road from Gauhati

Simla (Alt 7,232; rainfall 63) It is the summer seat of the Government of India Wild flower hall 1-6 miles from Simla has excellent hotel accommodation and good pine forests.

Srinagar (Alt 5,204; rainfall 26). 196 miles from Rawalpindi, it is rather warm duirng June, July and August. Pahlgam and Gulmarg also in Kashmir are better from the point of view of climate.

Murree and Quetta are now in Pakistan.

APPENDIX IX

HOT SPRINGS AND MINERAL WATERS

Numerous hot water and medicinal water springs occur all over India. Some of these are situated in most picturesque settings and would if developed form excellent health resorts.

There is no reason why in the near future some of these places should not develop into first class spas as occur in Europe and America and why the bottled waters of some of these springs should not sell as well, as do Vichy, Apenta and other waters. It is for the National Government to devise ways and means to transform these at present forgotten places into places where the ill and the tired populace of this country may hope to obtain alleviation of their ailments and recuperation. It would then be unnecessary for our nationals to go and seek cures in Bath and Buxton, in Carlsbad and Marienbad and in other health resorts of Europe and America

The following is a list Province-wise of some of the springs

N.-W. F. P.:

(a) *Kohat District*—1. Sulphur springs on the right bank of the Indus near Dandi hill station.

2. Sulphurous springs in the bed of the Algad stream

(b) *Hazara District*—1. Sulphur springs along the southern margin of Margalla range.

Sind:

(a) *Mangah Pir*—There are two springs and the temperature of the hotter spring is 127° F. It is the hottest spring in Sind The water is radioactive and being near Karachi it is visited by numerous people

(b) *Laki Spring*—It has a moderately copious discharge and it is said that it emits the largest quantity of sulphuretted hydrogen of all the springs in the province.

(c) *Shah Ruki Spring*—A large hot spring with a temperature of 100° F

(d) *Pir Ghazi Spring*—It is a fine hot water spring situated near a Muslim shrine.

(e) *Lakha Pir*—It has a strong smell of sulphuretted hydrogen. The temperature is 112° F.

Baluchistan:

Spintangi (Gaureji)—There are seven springs in this group. The largest spring has a copious discharge and water gushes out with some force. All the

springs are sulphurous and the smell of hydrogen sulphide fills the whole valley. All these springs are highly radioactive.

All the above springs are now in Pakistan.

Kashmir :

(*a*) *Phuk-nag*—There are three hot water sulphurous springs near Srinagar.

Islamabad—There are two sulphurous springs at the back of the town.

(*b*) *Baltistan*—Several thermal springs occur of which the most important are :

Bisil with a temperature of 160° F.

Chitrun is the largest spring in this group. Its temperature is 110° F.

Chongo—It occurs on the Braldu river. The temperature is 169° F.

Poonch :

(*a*) *Tattapani*—There is a copious discharge of water with a temperature of 190° F. The smell is sulphurous.

(*b*) Saira is situated above Kotli.

(*c*) *Rajauri*—It is sulphurous spring with a temperature of 140° F.

Sikkim :

(*a*) Phut Sachu.

(*b*) *Ralong Sachu*—It has the highest temperature (131° F) for this group. The water passes through copper bearing rocks and the calcareous deposit is stained green.

(*c*) *Momay*—It is situated at a height of 16,000 feet and is only a mile below the Kinchinjhow glacier. The temperature is 116° F.

Punjab :

(*a*) Manikaran is in Kulu. The pilgrims boil rice tied in cloth in the spring.

(*b*) The springs of Jwalamukhi are also in Kangra district and contain an alkaline iodide.

Rajputana :

(*a*) *Sohna*—It is 33 miles by road from Delhi. The water smells of sulphur and has a temperature of 125° F.

(b) Sipre spring is in Gwalior. Its waters have been bottled by a Bombay firm The following is an analysis of the Sipre water:

	Per cent.
Calcium carbonate	7.53
Magnesium carbonate	1 09
Sodium carbonate	7 77
Sodium nitrate	0 245
Sodium sulphate	0 199
Sodium chloride	1.49
Silica	0 56

It is reported to be very useful in chronic constipation and dyspeptic troubles.

United Provinces:

(a) Gangotri and Jamnotri hot springs are situated at an altitude of 10,000 ft

(b) Sahasradhara spring is 6 miles from Dehradun It has a strong sulphurous smell and the water on analysis revealed the presence of calcium sulphate, magnesium sulphate, calcium carbonate and carbon dioxide

The water should prove useful in chronic constipation and diseases of the gastro-intestinal tract.

(c) Gailia spring is near Banaras (2 miles south-west) Its water has digestive properties

(d) *Bridhkal Spring*—Hartirath, Banaras City The properties are digestive, diuretic and purgative.

Bihar:

Bihar has the largest number of thermal and medicinal springs Like the rest of India, these springs have not been exploited for medicinal or commercial purposes.

(a) *Rajghir group*—The important springs are Rajghir and Tapoban

(b) *Kharakpur group*—The important ones are Panchbhum, Singhi Rikh, Tatapani, Rishi Kund (140° F), Kanam Kund (145° F), Bhim Kund (145° F) The springs of Sitakund are most well known in Bihar

(c) *Hazaribagh group*—The important ones are Lurgurtha (160° F), Pindarkun (116°), Doari (110°-115° F), Suraj Kund (110°), Belkapi (163-190°), and Kesodih (182° F) These springs are sulphurous and saline in character.

(d) *Santal Parganas group*—The following are important. Nunbil (119 5°), Tatapani (102°) and Tatloi (148 5°).

Bengal:

Sitakund near Chittagong. There are a number of springs and include hot springs, cold springs, sulphurous springs, chalybeate and brackish springs

Godavari Valley:

(a) *Gundala*—It is in the bed of the Godavari. The water of the spring has a temperature of 140° F and emits sulphuretted hydrogen gas. It contains sulphate of soda, common salt and calcium chloride.

(b) *Bangak*—It is situated about 30 miles to the north-west of Gandala Its temperature is 110° F and from the deepest part of the pool bubbles of gas continue to escape. The water is tasteless and contains calcium carbonate in solution.

Bombay:

(a) Tawa spring is in Panch Mahal district. The temperature is 153° F and the water is bitter

(b) *Lasundra*—The springs are about 18 miles from Tawa. The temperature is 111° F

(c) *Vajrahai group consists of several springs*—Alkoli, Ganeshpuri, Nimboli; the springs are hot and emit large quantities of gas but the springs are not sulphurous

(d) *Satvli*—Situated near village of the same name. It is a hot spring (59 4° C) Large quantities of gas which is not sulphurous, are given off.

(e) *Kaknera*—The springs can be reached from Palghar railway station. The temperature is 52° C The water is radioactive.

Baroda State:

Unei—The hot springs have been converted into tanks and are the most well known in Gujarat The temperature is 57° C and there is copious emission of gas

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